

Mitsubishi Programmable Controller

MELSEC iQ-R
series

MELSEC iQ-R I/O Module User's Manual

-RX10
-RX40C7
-RX41C4
-RX42C4
-RY10R2
-RY40NT5P
-RY41NT2P
-RY42NT2P
-RY40PT5P
-RY41PT1P
-RY42PT1P
-RH42C4NT2P
-RG60



SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the MELSEC iQ-R Module Configuration Manual.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING" and "⚠ CAUTION".

 WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
 CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Incorrect output or malfunction due to a communication failure may result in an accident.
 - (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
 - (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
 - Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
 - Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
 - (3) All outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to "General Safety Requirements" in the MELSEC iQ-R Module Configuration Manual.
 - (4) Outputs may remain on or off due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
 - In an output circuit, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
 - Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
 - For the operating status of each station after a communication failure, refer to manuals relevant to the network. Incorrect output or malfunction due to a communication failure may result in an accident.
 - When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
 - Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Doing so may cause malfunction of the programmable controller system.
 - Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
-

[Design Precautions]

CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
 - During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
-

[Installation Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.
-

[Installation Precautions]

CAUTION

- Use the programmable controller in an environment that meets the general specifications in the Safety Guidelines included with the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
 - To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect interconnection may cause malfunction, failure, or drop of the module.
 - When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
 - Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
 - When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause malfunction.
 - When using an SD memory card, fully insert it into the SD memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
 - Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, or connector. Doing so can cause malfunction or failure of the module.
-

[Wiring Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before wiring. Failure to do so may result in electric shock or cause the module to fail or malfunction.
 - After installation and wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.
-

[Wiring Precautions]

CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohm or less. Failure to do so may result in electric shock or malfunction.
 - Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
 - Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
 - Tighten the terminal screws or connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
 - Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
 - A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
 - Mitsubishi programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
-

[Startup and Maintenance Precautions]

WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
 - Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so will cause the battery to produce heat, explode, ignite, or leak, resulting in injury and fire.
 - Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws. Failure to do so may result in electric shock.
-

[Startup and Maintenance Precautions]

CAUTION

- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
 - Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.
 - After the first use of the product, do not mount/remove the module to/from the base unit, and the terminal block to/from the module, and do not insert/remove the extended SRAM cassette to/from the CPU module more than 50 times (IEC 61131-2 compliant) respectively. Exceeding the limit may cause malfunction.
 - Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.
-

[Operating Precautions]

CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
-

[Disposal Precautions]

CAUTION

- When disposing of this product, treat it as industrial waste.
-

CONDITIONS OF USE FOR THE PRODUCT

- (1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
- i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
 - ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.
- (2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries. MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact the Mitsubishi representative in your region.

INTRODUCTION

Thank you for purchasing the Mitsubishi MELSEC iQ-R series programmable controllers.

This manual describes the procedures, system configuration, and troubleshooting of the relevant products listed below.

Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-R series programmable controller to handle the product correctly.

Please make sure that the end users read this manual.

Relevant products

RX10, RX40C7, RX41C4, RX42C4, RY10R2, RY40NT5P, RY41NT2P, RY42NT2P, RY40PT5P, RY41PT1P, RY42PT1P, RH42C4NT2P, RG60

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

- MELSEC iQ-R Module Configuration Manual
- Safety Guidelines (This manual is included with the base unit.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

Additional measures

No additional measures are necessary for the compliance of this product with EMC and Low Voltage Directives.

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RELEVANT MANUALS


User's manuals relevant to the module

Manual name [manual number]	Description	Available form
Relay Terminal Module User's Manual (Hardware) A6TE2-16SRN [IB-66833, 13JL53]	Performance specifications, part names, external dimensions, wiring, and installation of the A6TE2-16SRN relay terminal module	Print book
		PDF
Before Using the Product [BCN-P5999-0209]	Compatible models, specifications, and installation procedure of the Q6TE-18SN spring clamp terminal block	Print book
		PDF

This manual does not include detailed information on the following:

- General specifications
- Applicable CPU modules and the number of mountable modules
- Installation

For details, refer to the following.

 MELSEC iQ-R Module Configuration Manual

This manual does not include information on the module FB.

For details on the module FB, refer to the Function Block Reference for the module used.

Point

e-Manual refers to the Mitsubishi FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- The hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.

TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
CPU module	A generic term for the MELSEC iQ-R series CPU module
GX Works3	The product name of the software package for the MELSEC programmable controllers
L series	The abbreviation for the Mitsubishi programmable controller MELSEC-L series
Q series	The abbreviation for the Mitsubishi programmable controller MELSEC-Q series
RCPU	Another term for the MELSEC iQ-R series CPU module
Engineering tool	Another term for GX Works3
Power supply module	A generic term for the MELSEC iQ-R series power supply module

1 PRODUCT LISTS

1

1.1 Product Lists

Input modules

Module name		Input specifications	Number of occupied I/O points	Current consumption	Weight	Model	Reference
AC input module		Terminal block 100 to 120VAC, 16 points	16 points	110mA	0.18kg	RX10	Page 16 RX10 AC input module
DC input module	Positive/negative common shared type	Terminal block 24VDC, 16 points	16 points	110mA	0.16kg	RX40C7	Page 18 RX40C7 DC input module (positive/negative common shared type)
		40-pin connector 24VDC, 32 points	32 points	150mA	0.11kg	RX41C4	Page 19 RX41C4 DC input module (positive/negative common shared type)
		40-pin connector (×2) 24VDC, 64 points	64 points	180mA	0.13kg	RX42C4	Page 20 RX42C4 DC input module (positive/negative common shared type)

Output modules

Module name		Output specifications	Number of occupied I/O points	Current consumption	Weight	Model	Reference
Contact output module		Terminal block 240VAC/24VDC, 2A/point, 16 points	16 points	450mA	0.22kg	RY10R2	Page 23 RY10R2 contact output module
Transistor output module	Sink type	Terminal block 12 to 24VDC, 0.5A/point, 16 points	16 points	140mA	0.16kg	RY40NT5P	Page 24 RY40NT5P transistor output module (sink type)
		40-pin connector 12 to 24VDC, 0.2A/point, 32 points	32 points	180mA	0.11kg	RY41NT2P	Page 25 RY41NT2P transistor output module (sink type)
		40-pin connector (×2) 12 to 24VDC, 0.2A/point, 64 points	64 points	250mA	0.13kg	RY42NT2P	Page 26 RY42NT2P transistor output module (sink type)
	Source type	Terminal block 12 to 24VDC, 0.5A/point, 16 points	16 points	130mA	0.16kg	RY40PT5P	Page 27 RY40PT5P transistor output module (source type)
		40-pin connector 12 to 24VDC, 0.1A/point, 32 points	32 points	190mA	0.11kg	RY41PT1P	Page 28 RY41PT1P transistor output module (source type)
		40-pin connector (×2) 12 to 24VDC, 0.1A/point, 64 points	64 points	290mA	0.13kg	RY42PT1P	Page 29 RY42PT1P transistor output module (source type)

I/O combined module

Module name		Input specifications	Output specifications	Number of occupied I/O points	Current consumption	Weight	Model	Reference
DC input/transistor output combined module	<ul style="list-style-type: none"> Input part: Positive/negative common shared type Output part: Sink type 	40-pin connector 24VDC, 32 points	40-pin connector 12 to 24VDC, 0.2A/point, 32 points	32 points	220mA	0.13kg	RH42C4NT2P	Page 31 RH42C4NT2P DC input/transistor output combined module (sink type)

Blank cover module

Module name	Application	Number of occupied I/O points	Current consumption	Weight	Model	Reference
Blank cover module	Use this module to prevent dust at a space where an I/O module is not mounted.	16 points ^{*1}	—	0.07kg	RG60	Page 33 RG60 blank cover module

^{*1} This number can be changed in the I/O assignment setting of the system parameters.

1.2 Reading a Model Name

- For the input module or output module

R Y 4 0 N T 5 P

(1) (2) (3) (4) (5) (6)

- For the I/O combined module

R H 4 2 C 4 N T 2 P

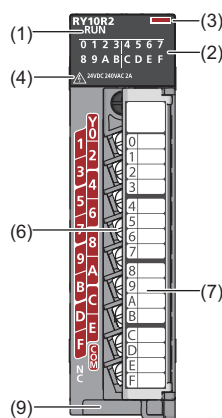
(1) (2) (3) Input type (4) (5) Output type (4) (5) (6)

No.	Item	Symbol	Specifications			
(1)	Module type	X	Input			
		Y	Output			
		H	I/O combined			
No.	Item	Symbol	Specifications			
			Input module		Output module	
			AC input	DC input	Contact output	Transistor output
(2)	Voltage specifications	1	100 to 120VAC	—	24VDC/240VAC	—
		4	—	24VDC	—	12 to 24VDC
No.	Item	Symbol	Specifications			
(3)	Number of I/O points	0	16 points			
		1	32 points			
		2	64 points			
No.	Item	Symbol	Specifications			
(4)	Input/output type	None	AC input			
		C	DC input (positive/negative common shared type)			
		NT	Transistor output (sink type)			
		PT	Transistor output (source type)			
		R	Contact output			
No.	Item	Symbol	Specifications			
			Input module		Output module	
			AC input	DC input	Contact output	Transistor output
(5)	Current specifications	1	—	—	—	0.1A
		2	—	—	2A	0.2A
		4	—	4mA	—	—
		5	—	—	—	0.5A
		7	—	7mA	—	—
No.	Item	Symbol	Specifications			
(6)	Extension specifications	P	With the protection function			

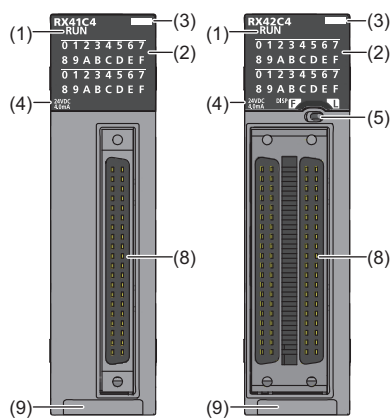
2 PART NAMES

This section describes the part names of the I/O module.

18-point screw terminal block type



40-pin connector type



No.	Name	Description
(1)	RUN LED	Indicates the operating status. On: In operation Off: 5V power off
(2)	I/O status indicator LED	Indicates the I/O status. On: I/O signal on Off: I/O signal off
(3)	Module identification lamp	Light gray: Input Dark orange: Output
(4)	Rate indication	Indicates the rated voltage, and input current or output current.
(5)	Indication selector switch ^{*1}	<ul style="list-style-type: none"> For the input module or output module: A switch for changing the LED indication to either the first-half 32 points or the latter-half 32 points of a 64-point module For the I/O combined module: A switch for changing the LED indication for input or output
(6)	Terminal block	18-point screw terminal block. For the terminal layout, refer to the following. ☞ Page 16 Performance Specifications
(7)	Terminal block cover	Covers for preventing electric shock while the power is on
(8)	Connector for external devices (40 pins)	A connector for connecting I/O signal wire from external devices. For the signal layout, refer to the following. ☞ Page 16 Performance Specifications
(9)	Production information marking	Shows the production information (16 digits) of the module.

^{*1} Operate the indication selector switch with a finger. If the operation is difficult with a finger, use a pen with a long narrow tip, and others. In this case, be careful not to damage the module. Do not use tools such as a driver because of the possibility of damaging the switch part.

3 SPECIFICATIONS

This chapter describes the performance specifications.

3.1 Performance Specifications

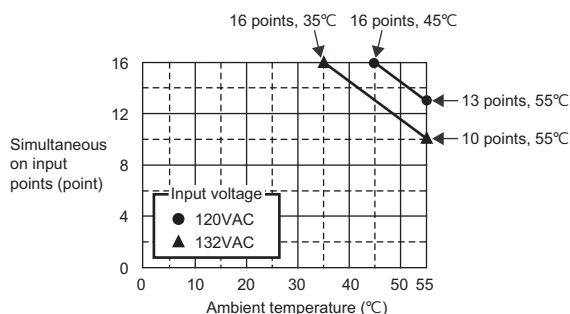
This section describes the performance specifications of the I/O modules.

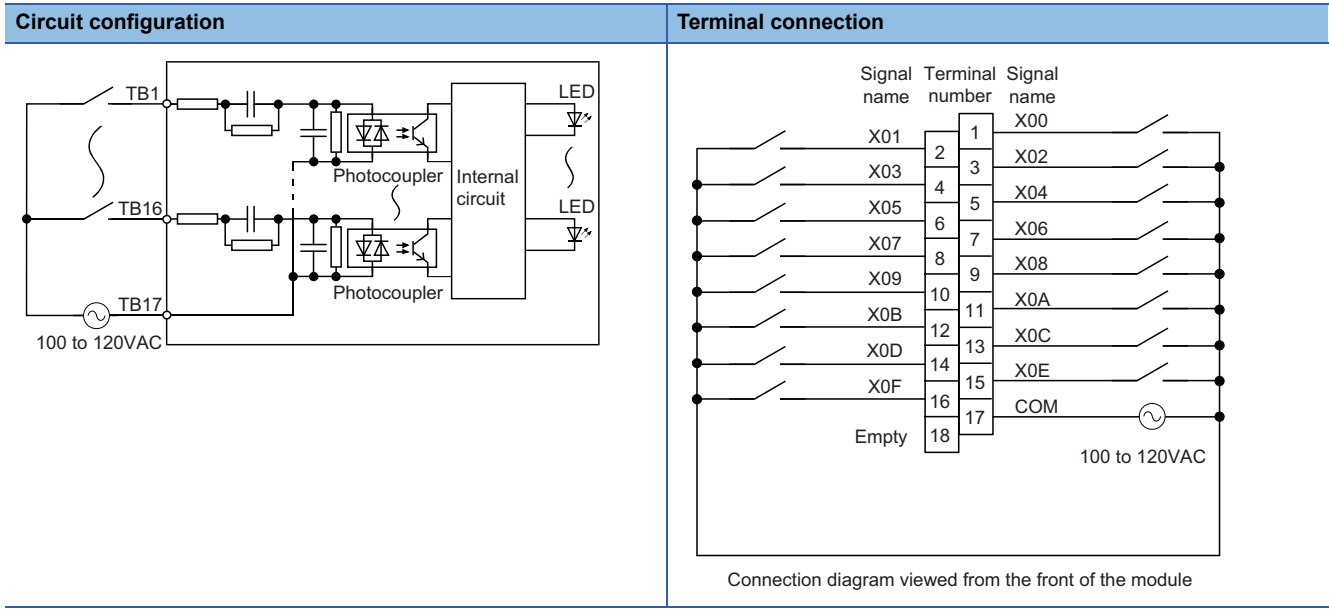
Input modules

RX10 AC input module

Item	Specifications	Appearance
Number of input points	16 points	
Rated input voltage/rated frequency	100 to 120VAC (+10%/-15%), 50/60Hz (±3Hz)	
Input voltage distortion ratio	Within 5%	
Rated input current	8.2mA (100VAC, 60Hz), 6.8mA (100VAC, 50Hz)	
Inrush current	200mA maximum within 1ms	
ON voltage/ON current	80VAC or higher/5mA or higher (50Hz, 60Hz)	
OFF voltage/OFF current	30VAC or lower/1.7mA or lower (50Hz, 60Hz)	
Input impedance	12.2kΩ (60Hz), 14.6kΩ (50Hz)	
Response time	OFF→ON	
	ON→OFF	
Withstand voltage	1400VACrms, 1 minute	
Insulation resistance	10MΩ or higher by insulation resistance tester	
Noise immunity	Simulator noise 1500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree	IP1X	
Wiring method for common	16 points/common (common terminal: TB17)	
Number of occupied I/O points	16 points (I/O assignment: Input 16 points)	
Interrupt function	Available (can be set in the parameters of the CPU module)	
External connections	18-point screw terminal block (M3×6 screw) Page 46 18-point screw terminal block type module	
Internal current consumption (5VDC)	110mA (TYP. all points ON)	
Weight	0.18kg	

Derating chart

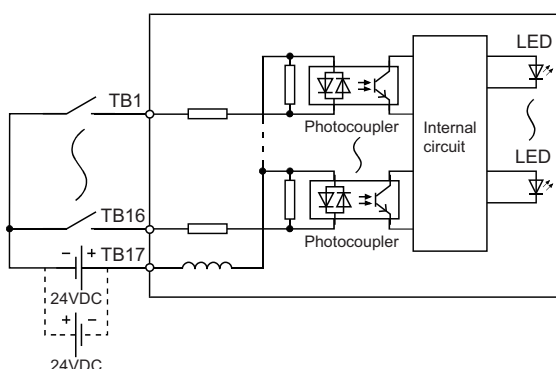




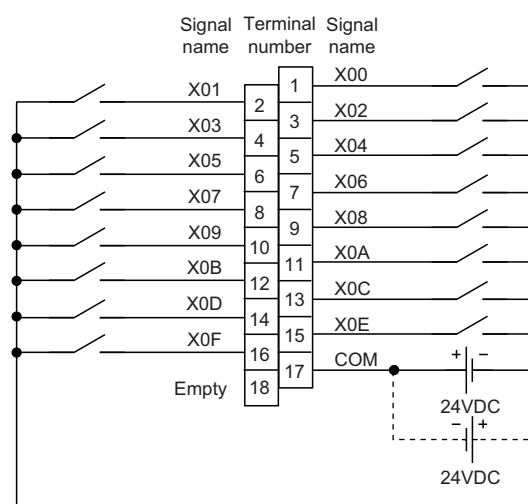
RX40C7 DC input module (positive/negative common shared type)

Item	Specifications	Appearance
Number of input points	16 points	
Rated input voltage	24VDC (ripple ratio: within 5%) (allowable voltage range: 20.4 to 28.8VDC)	
Rated input current	7.0mA TYP. (at 24VDC)	
ON voltage/ON current	15V or higher/4mA or higher	
OFF voltage/OFF current	8V or lower/2mA or lower	
Input resistance	3.3kΩ	
Response time	☞ Page 18 Input response time	
Withstand voltage	510VACrms, 1 minute	
Insulation resistance	10MΩ or higher by insulation resistance tester	
Noise immunity	Simulator noise 500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree	IP2X	
Wiring method for common	16 points/common (common terminal: TB17)	
Number of occupied I/O points	16 points (I/O assignment: Input 16 points)	
Interrupt function	Available (can be set in the parameters of the CPU module)	
External connections	18-point screw terminal block (M3×6 screw) ☞ Page 46 18-point screw terminal block type module	
Internal current consumption (5VDC)	110mA (TYP. all points ON)	
Weight	0.16kg	

Circuit configuration



Terminal connection



Connection diagram viewed from the front of the module

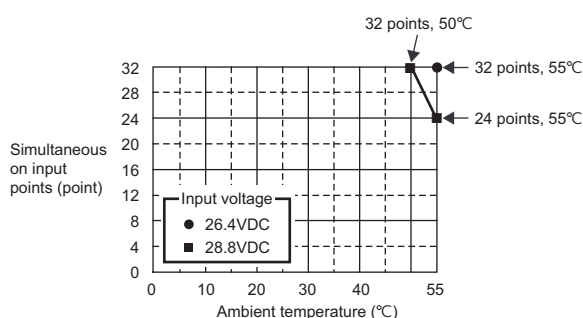
Input response time

Timing	Setting value								
	0.1ms	0.2ms	0.4ms	0.6ms	1ms	5ms	10ms	20ms	70ms
OFF→ON (MAX)	0.1ms	0.2ms	0.4ms	0.6ms	1ms	5ms	10ms	20ms	70ms
ON→OFF (MAX)	0.35ms	0.4ms	0.5ms	0.7ms	1ms	5ms	10ms	20ms	70ms

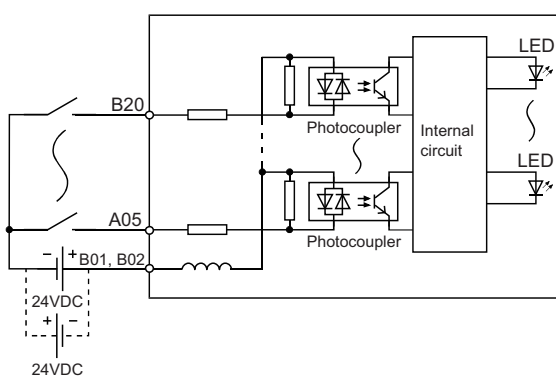
RX41C4 DC input module (positive/negative common shared type)

Item	Specifications	Appearance
Number of input points	32 points	
Rated input voltage	24VDC (ripple ratio: within 5%) (allowable voltage range: 20.4 to 28.8VDC)	
Rated input current	4.0mA TYP. (at 24VDC)	
ON voltage/ON current	19V or higher/3mA or higher	
OFF voltage/OFF current	6V or lower/1.0mA or lower	
Input resistance	5.3kΩ	
Response time	☞ Page 20 Input response time	
Withstand voltage	510VACrms, 1 minute	
Insulation resistance	10MΩ or higher by insulation resistance tester	
Noise immunity	Simulator noise 500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree	IP2X	
Wiring method for common	32 points/common (common terminal: B01, B02)	
Number of occupied I/O points	32 points (I/O assignment: Input 32 points)	
Interrupt function	Available (can be set in the parameters of the CPU module)	
External connections	40-pin connector ☞ Page 47 40-pin connector type module	
Internal current consumption (5VDC)	150mA (TYP. all points ON)	
Weight	0.11kg	

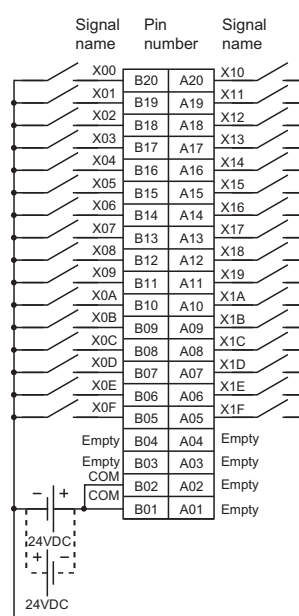
Derating chart



Circuit configuration



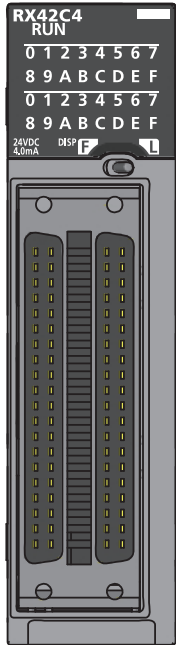
Terminal connection



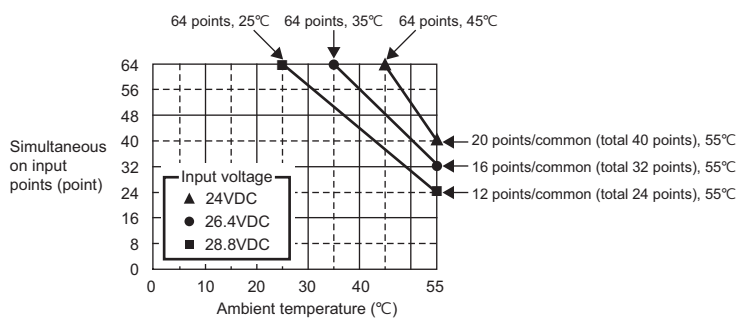
Input response time

Timing	Setting value								
	0.1ms	0.2ms	0.4ms	0.6ms	1ms	5ms	10ms	20ms	70ms
OFF→ON (MAX)	0.1ms	0.2ms	0.4ms	0.6ms	1ms	5ms	10ms	20ms	70ms
ON→OFF (MAX)	0.2ms	0.3ms	0.5ms	0.7ms	1ms	5ms	10ms	20ms	70ms

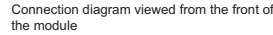
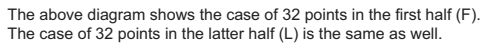
RX42C4 DC input module (positive/negative common shared type)

Item	Specifications	Appearance
Number of input points	64 points	
Rated input voltage	24VDC (ripple ratio: within 5%) (allowable voltage range: 20.4 to 28.8VDC)	
Rated input current	4.0mA TYP. (at 24VDC)	
ON voltage/ON current	19V or higher/3mA or higher	
OFF voltage/OFF current	6V or lower/1.0mA or lower	
Input resistance	5.3kΩ	
Response time	☞ Page 21 Input response time	
Withstand voltage	510VACrms, 1 minute	
Insulation resistance	10MΩ or higher by insulation resistance tester	
Noise immunity	Simulator noise 500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree	IP2X	
Wiring method for common	32 points/common (common terminal: 1B01, 1B02, 2B01, 2B02)	
Number of occupied I/O points	64 points (I/O assignment: Input 64 points)	
Interrupt function	Available (can be set in the parameters of the CPU module)	
External connections	40-pin connector ☞ Page 47 40-pin connector type module	
Internal current consumption (5VDC)	180mA (TYP. all points ON)	
Weight	0.13kg	

Derating chart



Terminal connection



Connection diagram viewed from the front of the module

■Input response time

Timing	Setting value								
	0.1ms	0.2ms	0.4ms	0.6ms	1ms	5ms	10ms	20ms	70ms
OFF→ON (MAX)	0.1ms	0.2ms	0.4ms	0.6ms	1ms	5ms	10ms	20ms	70ms
ON→OFF (MAX)	0.2ms	0.3ms	0.5ms	0.7ms	1ms	5ms	10ms	20ms	70ms

Output modules

The following output modules are equipped with the overload protection function and overheat protection function.

Applicable module models.....RY40NT5P, RY41NT2P, RY42NT2P, RY40PT5P, RY41PT1P, RY42PT1P

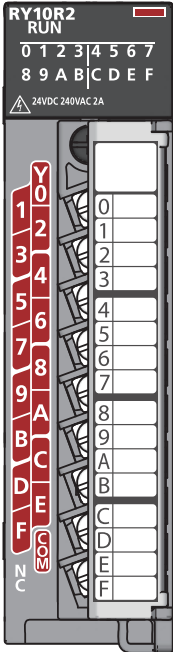


Function	Description
Overload protection ^{*1}	<ul style="list-style-type: none">• If an output module detects an overcurrent, current limiter operation^{*2} is activated to limit the output current.• For the overcurrent detection value and limit current, check the "Overload protection" column of the specifications of each module.• If the load current falls below the overcurrent detection value, the normal operation resumes.
Overheat protection ^{*1}	<ul style="list-style-type: none">• If an output module continues to output an overcurrent due to overload, heat is generated inside the module. If a high temperature heat is detected inside the module, the output turns off.• The number of output points where the overheat protection function can be used simultaneously varies at each module. Check the "Overheat protection" column of the specifications of each module.• If the heat drops, the normal operation resumes automatically.

^{*1} This function is intended to protect the internal circuit of a module, not to protect external devices.

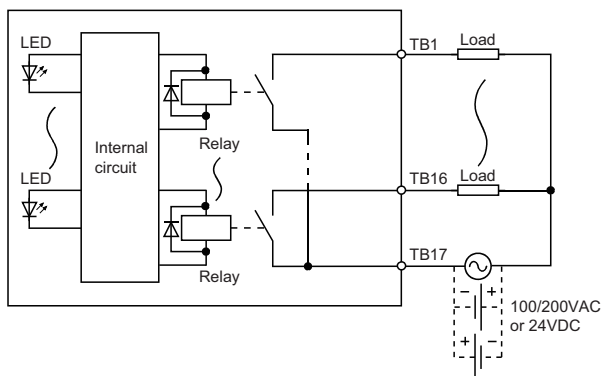
Additionally, an abnormal load can cause the module internal temperature to rise, resulting in deterioration of the output elements and discoloration of the case and printed-circuit board. In the event of an abnormal load, turn off the corresponding output immediately and eliminate the cause.

^{*2} This operation limits an overcurrent to a certain current value, which allows a continuous output.

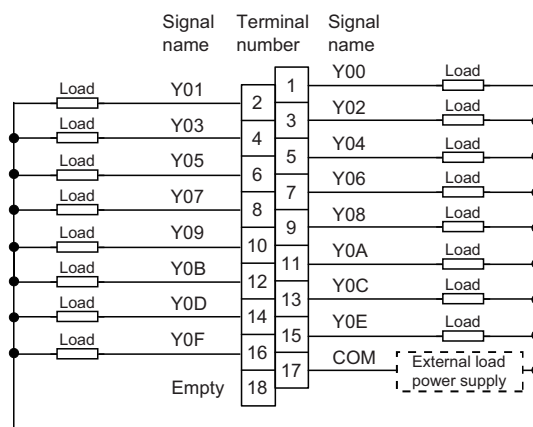
RY10R2 contact output module

Item		Specifications	Appearance
Number of output points		16 points	
Rated switching voltage/current		24VDC 2A (resistive load)/point, 8A/common 240VAC 2A (COSφ = 1)/point, 8A/common	
Minimum switching load		5VDC, 1mA	
Maximum switching load		264VAC 125VDC	
Response time	OFF→ON	10ms or less	
	ON→OFF	12ms or less	
Life	Mechanical	20 million times or more	
	Electrical	 Page 42 Relay life (contact switching life)	
Maximum switching frequency		3600 times/hour	
Surge suppressor		None	
Fuse		None	
Withstand voltage		2300VACrms, 1 minute	
Insulation resistance		10MΩ or higher by insulation resistance tester	
Noise immunity		Simulator noise 1500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree		IP1X	
Wiring method for common		16 points/common (common terminal: TB17)	
Number of occupied I/O points		16 points (I/O assignment: Output 16 points)	
External connections		18-point screw terminal block (M3×6 screw)  Page 46 18-point screw terminal block type module	
Internal current consumption (5VDC)		450mA (TYP. all points ON)	
Weight		0.22kg	

Circuit configuration

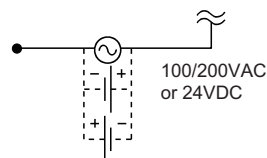


Terminal connection

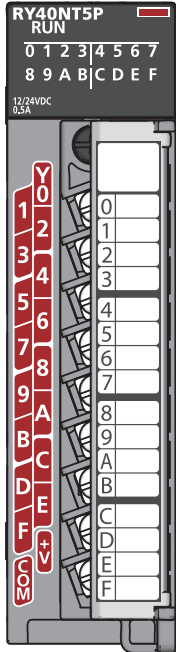


Connection diagram viewed from the front of the module

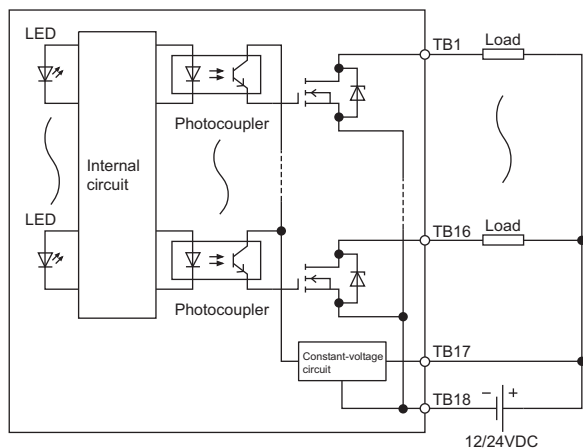
The following diagram shows the external load power supply.



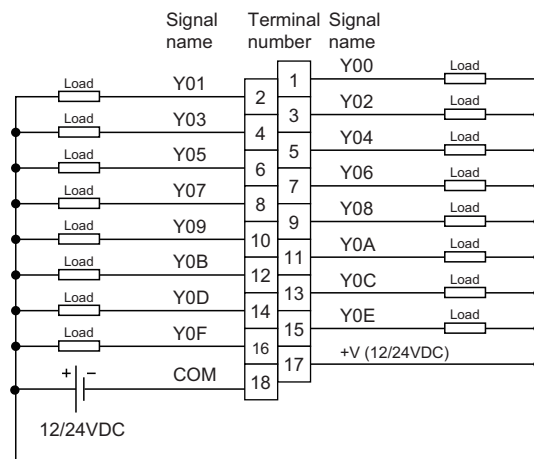
RY40NT5P transistor output module (sink type)

Item		Specifications	Appearance
Number of output points		16 points	
Rated load voltage		12/24 VDC (allowable voltage range: 10.2 to 28.8VDC)	
Maximum load current		0.5A/point, 5A/common	
Maximum inrush current		Current is to be limited by the overload protection function.	
Leakage current at OFF		0.1mA or lower	
Maximum voltage drop at ON		0.2VDC (TYP.) 0.5A, 0.3VDC (MAX.) 0.5A	
Response time	OFF→ON	0.5ms or less	
	ON→OFF	1ms or less (rated load, resistive load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple ratio: within 5%) (allowable voltage range: 10.2 to 28.8VDC)	
	Current	4mA (at 24VDC)	
Withstand voltage		510VACrms, 1 minute	
Insulation resistance		10MΩ or higher by insulation resistance tester	
Noise immunity		Simulator noise 500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree		IP2X	
Wiring method for common		16 points/common (common terminal: TB18)	
Number of occupied I/O points		16 points (I/O assignment: Output 16 points)	
Protection functions	Overload protection	Limit current with overload protection at overcurrent detection: 1.5 to 3.5A/point Activated in increments of 1 point. (☞ Page 22 Output modules)	
	Overheat protection	Activated in increments of 1 point. (☞ Page 22 Output modules)	
External connections		18-point screw terminal block (M3×6 screw) ☞ Page 46 18-point screw terminal block type module	
Internal current consumption (5VDC)		140mA (TYP. all points ON)	
Weight		0.16kg	

Circuit configuration

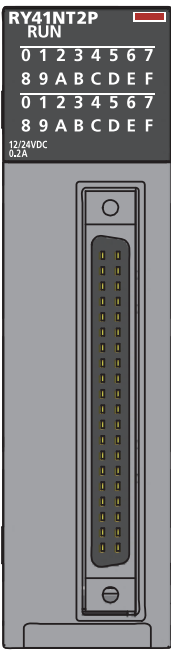


Terminal connection

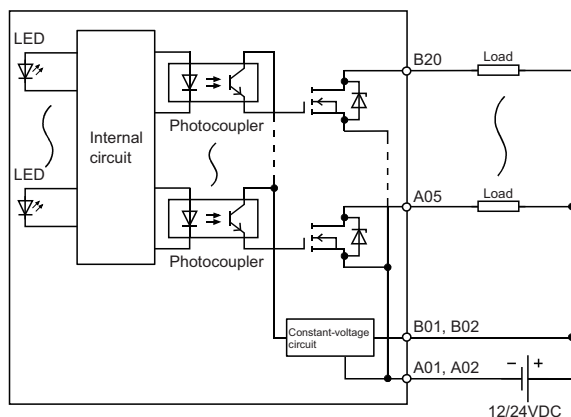


Connection diagram viewed from the front of the module

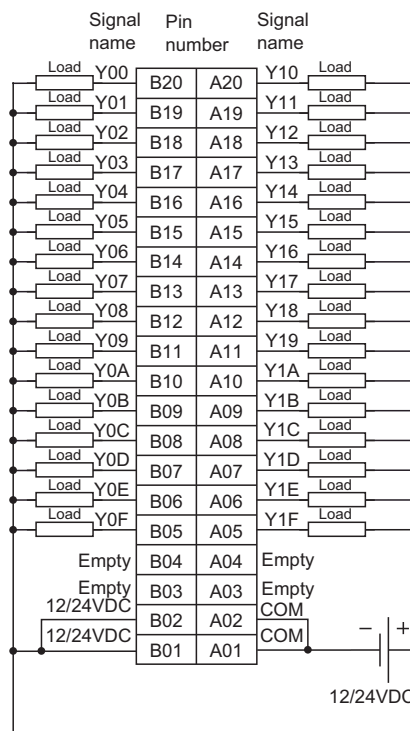
RY41NT2P transistor output module (sink type)

Item		Specifications	Appearance
Number of output points		32 points	
Rated load voltage		12/24 VDC (allowable voltage range: 10.2 to 28.8VDC)	
Maximum load current		0.2A/point, 2A/common	
Maximum inrush current		Current is to be limited by the overload protection function.	
Leakage current at OFF		0.1mA or lower	
Maximum voltage drop at ON		0.2VDC (TYP.) 0.2A, 0.3VDC (MAX.) 0.2A	
Response time	OFF→ON	0.5ms or less	
	ON→OFF	1ms or less (rated load, resistive load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple ratio: within 5%) (allowable voltage range: 10.2 to 28.8VDC)	
	Current	16mA (at 24VDC)	
Withstand voltage		510VACrms, 1 minute	
Insulation resistance		10MΩ or higher by insulation resistance tester	
Noise immunity		Simulator noise 500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree		IP2X	
Wiring method for common		32 points/common (common terminal: A01, A02)	
Number of occupied I/O points		32 points (I/O assignment: Output 32 points)	
Protection functions	Overload protection	Limit current with overload protection at overcurrent detection: 1.5 to 3A/point Activated in increments of 1 point. (☞ Page 22 Output modules)	
	Overheat protection	Activated in increments of 1 point. (☞ Page 22 Output modules)	
External connections		40-pin connector ☞ Page 47 40-pin connector type module	
Internal current consumption (5VDC)		180mA (TYP. all points ON)	
Weight		0.11kg	

Circuit configuration

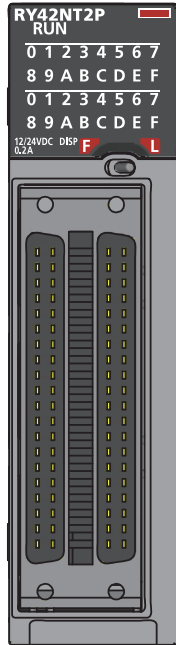


Terminal connection

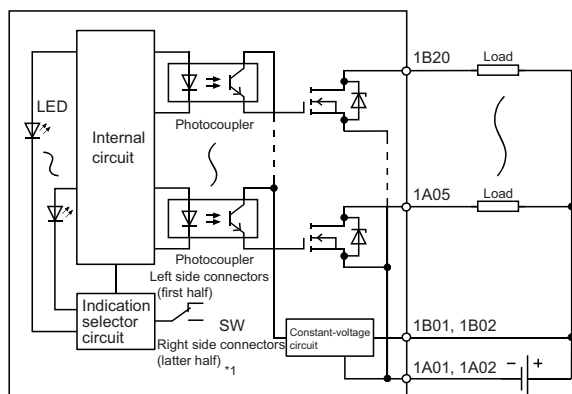


Connection diagram viewed from the front of the module

RY42NT2P transistor output module (sink type)

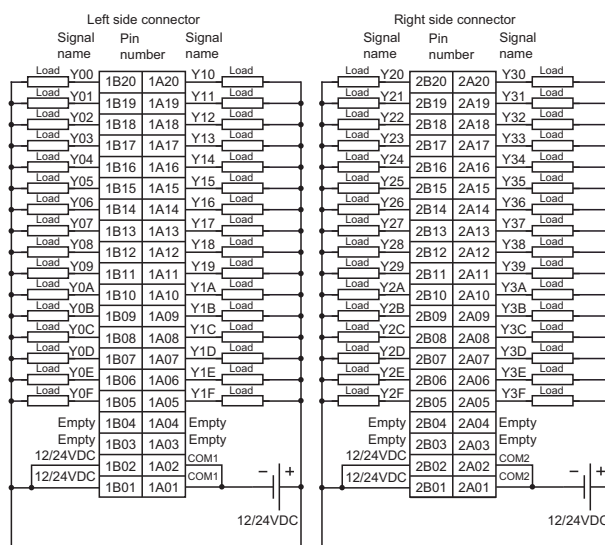
Item		Specifications	Appearance
Number of output points		64 points	
Rated load voltage		12/24 VDC (allowable voltage range: 10.2 to 28.8VDC)	
Maximum load current		0.2A/point, 2A/common	
Maximum inrush current		Current is to be limited by the overload protection function.	
Leakage current at OFF		0.1mA or lower	
Maximum voltage drop at ON		0.2VDC (TYP.) 0.2A, 0.3VDC (MAX.) 0.2A	
Response time	OFF→ON	0.5ms or less	
	ON→OFF	1ms or less (rated load, resistive load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple ratio: within 5%) (allowable voltage range: 10.2 to 28.8VDC)	
	Current	16mA (at 24VDC)/common	
Withstand voltage		510VACrms, 1 minute	
Insulation resistance		10MΩ or higher by insulation resistance tester	
Noise immunity		Simulator noise 500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree		IP2X	
Wiring method for common		32 points/common (common terminal: 1A01, 1A02, 2A01, 2A02)	
Number of occupied I/O points		64 points (I/O assignment: Output 64 points)	
Protection functions	Overload protection	Limit current with overload protection at overcurrent detection: 1.5 to 3A/point Activated in increments of 1 point. (Page 22 Output modules)	
	Overheat protection	Activated in increments of 1 point. (Page 22 Output modules)	
External connections		40-pin connector Page 47 40-pin connector type module	
Internal current consumption (5VDC)		250mA (TYP. all points ON)	
Weight		0.13kg	

Circuit configuration



The above diagram shows the case of 32 points in the first half (F). 12/24VDC
The case of 32 points in the latter half (L) is the same as well.

Terminal connection

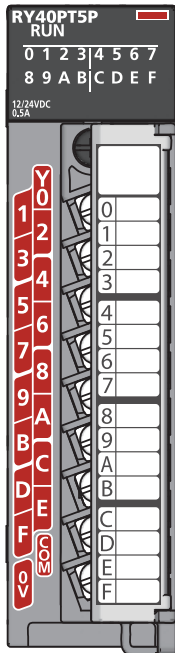


Connection diagram viewed from the front of the module

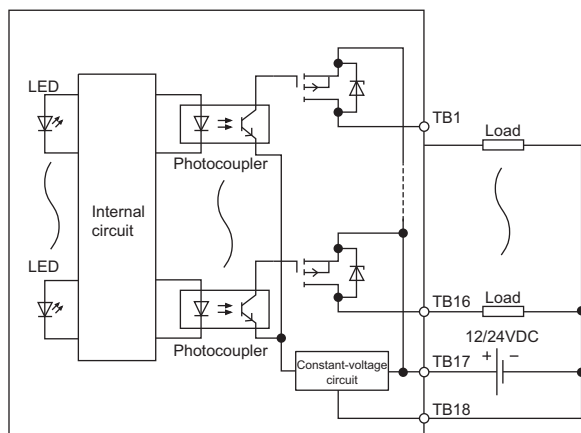
Connection diagram viewed from the front of the module

*1 The LED indicates the first half (Y00 to Y1F) by turning the switch to the left (F), while the LED indicates the latter half (Y20 to Y3F) by turning the switch to the right (L).

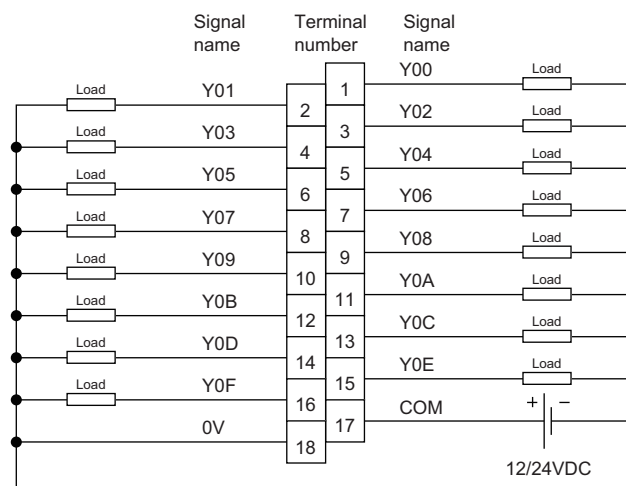
RY40PT5P transistor output module (source type)

Item		Specifications	Appearance
Number of output points		16 points	
Rated load voltage		12/24 VDC (allowable voltage range: 10.2 to 28.8VDC)	
Maximum load current		0.5A/point, 5A/common	
Maximum inrush current		Current is to be limited by the overload protection function.	
Leakage current at OFF		0.1mA or lower	
Maximum voltage drop at ON		0.2VDC (TYP.) 0.5A, 0.3VDC (MAX.) 0.5A	
Response time	OFF→ON	0.5ms or less	
	ON→OFF	1ms or less (rated load, resistive load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple ratio: within 5%) (allowable voltage range: 10.2 to 28.8VDC)	
	Current	16mA (at 24VDC)	
Withstand voltage		510VACrms, 1 minute	
Insulation resistance		10MΩ or higher by insulation resistance tester	
Noise immunity		Simulator noise 500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree		IP2X	
Wiring method for common		16 points/common (common terminal: TB17)	
Number of occupied I/O points		16 points (I/O assignment: Output 16 points)	
Protection functions	Overload protection	Overcurrent detection: 1.5A or higher/point Activated in increments of 1 point. (☞ Page 22 Output modules)	
	Overheat protection	Activated in increments of 1 point. (☞ Page 22 Output modules)	
External connections		18-point screw terminal block (M3×6 screw) ☞ Page 46 18-point screw terminal block type module	
Internal current consumption (5VDC)		130mA (TYP. all points ON)	
Weight		0.16kg	

Circuit configuration

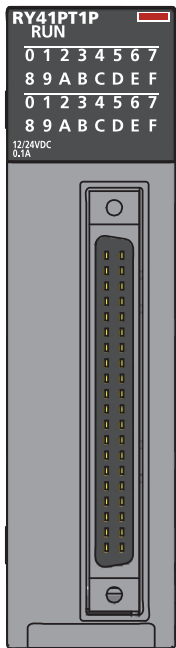


Terminal connection

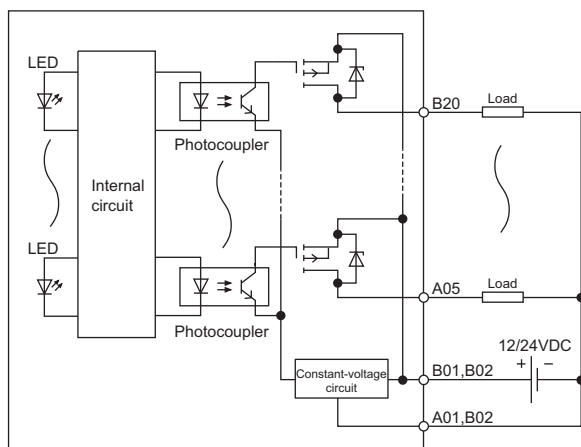


Connection diagram viewed from the front of the module.

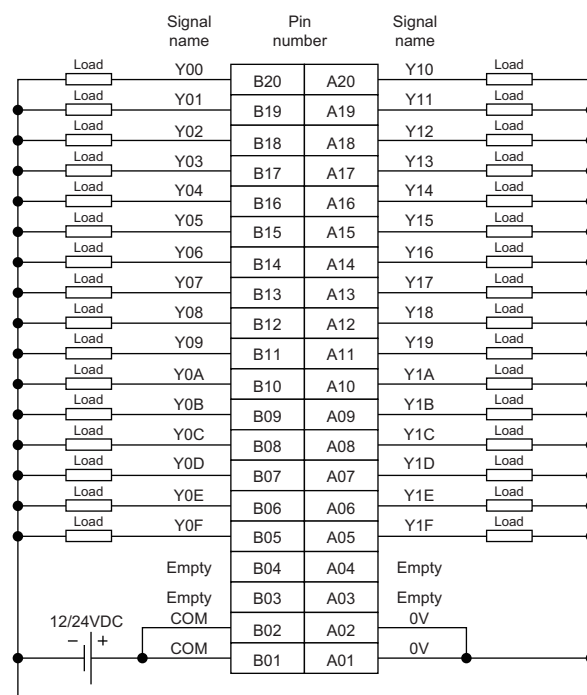
RY41PT1P transistor output module (source type)

Item		Specifications	Appearance
Number of output points		32 points	
Rated load voltage		12/24 VDC (allowable voltage range: 10.2 to 28.8VDC)	
Maximum load current		0.1A/point, 2A/common	
Maximum inrush current		Current is to be limited by the overload protection function.	
Leakage current at OFF		0.1mA or lower	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Response time	OFF→ON	0.5ms or less	
	ON→OFF	1ms or less (rated load, resistive load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple ratio: within 5%) (allowable voltage range: 10.2 to 28.8VDC)	
	Current	19mA (at 24VDC)	
Withstand voltage		510VACrms, 1 minute	
Insulation resistance		10MΩ or higher by insulation resistance tester	
Noise immunity		Simulator noise 500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree		IP2X	
Wiring method for common		32 points/common (common terminal: B01, B02)	
Number of occupied I/O points		32 points (I/O assignment: Output 32 points)	
Protection functions	Overload protection	Limit current with overload protection at overcurrent detection: 1 to 3A/point Activated in increments of 1 point. (☞ Page 22 Output modules)	
	Overheat protection	Activated in increments of 2 points. (☞ Page 22 Output modules)	
External connections		40-pin connector ☞ Page 47 40-pin connector type module	
Internal current consumption (5VDC)		190mA (TYP. all points ON)	
Weight		0.11kg	

Circuit configuration

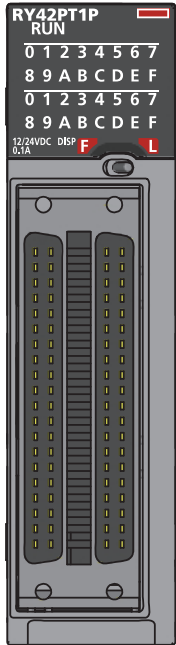


Terminal connection



Connection diagram viewed from the front of the module.

RY42PT1P transistor output module (source type)

Item		Specifications	Appearance
Number of output points		64 points	
Rated load voltage		12/24 VDC (allowable voltage range: 10.2 to 28.8VDC)	
Maximum load current		0.1A/point, 2A/common	
Maximum inrush current		Current is to be limited by the overload protection function.	
Leakage current at OFF		0.1mA or lower	
Maximum voltage drop at ON		0.1VDC (TYP.) 0.1A, 0.2VDC (MAX.) 0.1A	
Response time	OFF→ON	0.5ms or less	
	ON→OFF	1ms or less (rated load, resistive load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple ratio: within 5%) (allowable voltage range: 10.2 to 28.8VDC)	
	Current	19mA (at 24VDC)/common	
Withstand voltage		510VACrms, 1 minute	
Insulation resistance		10MΩ or higher by insulation resistance tester	
Noise immunity		Simulator noise 500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree		IP2X	
Wiring method for common		32 points/common (common terminal: 1B01, 1B02, 2B01, 2B02)	
Number of occupied I/O points		64 points (I/O assignment: Output 64 points)	
Protection functions	Overload protection	Limit current with overload protection at overcurrent detection: 1 to 3A/point Activated in increments of 1 point. (☞ Page 22 Output modules)	
	Overheat protection	Activated in increments of 2 points. (☞ Page 22 Output modules)	
External connections		40-pin connector ☞ Page 47 40-pin connector type module	
Internal current consumption (5VDC)		290mA (TYP. all points ON)	
Weight		0.13kg	

Circuit configuration

The diagram illustrates the internal circuit configuration for the first half of the module. It features an LED connected to an internal circuit. Two photocouplers are shown, each with an internal circuit and a switch (sw). The left side connectors (first half) are labeled 1B20, 1B19, 1B18, 1B17, 1B16, 1B15, 1B14, 1B13, 1B12, 1B11, 1B10, 1B09, 1B08, 1B07, 1B06, and 1B05. The right side connectors (last half) are labeled 1A20, 1A19, 1A18, 1A17, 1A16, 1A15, 1A14, 1A13, 1A12, 1A11, 1A10, 1A09, 1A08, 1A07, 1A06, and 1A05. A constant-voltage circuit is connected to the right side connectors. The module is powered by a 12/24VDC source.

The above diagram shows the first half of 32 points (F).
The last half of 32 points (L) are similar.

Terminal connection

The diagram shows the terminal connections for the left and right side connectors. The left side connector has 32 pins, and the right side connector has 32 pins. The pin numbers and signal names are listed below.

Left side connector		
Signal name	Pin number	Signal name
Load Y00	1B20	Y10
Load Y01	1B19	1A19
Load Y02	1B18	1A18
Load Y03	1B17	1A17
Load Y04	1B16	1A16
Load Y05	1B15	1A15
Load Y06	1B14	1A14
Load Y07	1B13	1A13
Load Y08	1B12	1A12
Load Y09	1B11	1A11
Load Y0A	1B10	1A10
Load Y0B	1B09	1A09
Load Y0C	1B08	1A08
Load Y0D	1B07	1A07
Load Y0E	1B06	1A06
Load Y0F	1B05	1A05
Empty	1B04	1A04
Empty	1B03	1A03
Empty	1B02	1A02
COM1	1B01	1A01

12/24VDC

Right side connector		
Signal name	Pin number	Signal name
Load Y20	2B20	2A20
Load Y21	2B19	2A19
Load Y22	2B18	2A18
Load Y23	2B17	2A17
Load Y24	2B16	2A16
Load Y25	2B15	2A15
Load Y26	2B14	2A14
Load Y27	2B13	2A13
Load Y28	2B12	2A12
Load Y29	2B11	2A11
Load Y2A	2B10	2A10
Load Y2B	2B09	2A09
Load Y2C	2B08	2A08
Load Y2D	2B07	2A07
Load Y2E	2B06	2A06
Load Y2F	2B05	2A05
Empty	2B04	2A04
Empty	2B03	2A03
Empty	2B02	2A02
COM2	2B01	2A01

12/24VDC

Viewed from the front of the module.

Viewed from the front of the module.

*1 The LED indicates the first half (Y00 to Y1F) by turning the switch to the left (F), while the LED indicates the latter half (Y20 to Y3F) by turning the switch to the right (L).

I/O combined module

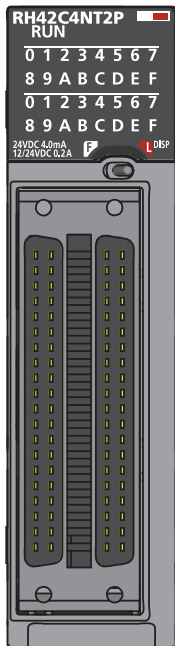




The I/O combined module is equipped with the overload protection function and overheat protection function.

Function	Description
Overload protection ^{*1}	<ul style="list-style-type: none">• If the output side detects an overcurrent, current limiter operation^{*2} is activated to limit the output current.• For the overcurrent detection value and limit current, check the "Overload protection" column of the specifications of each module.• If the load current falls below the overcurrent detection value, the normal operation resumes.
Overheat protection ^{*1}	<ul style="list-style-type: none">• If an output side continues to output an overcurrent due to overload, heat is generated inside the module. If a high temperature heat is detected inside the module, the output turns off.• The number of output points where the overheat protection function can be used simultaneously varies at each module. Check the "Overheat protection" column of the specifications of each module.• If the heat drops, the normal operation resumes automatically.

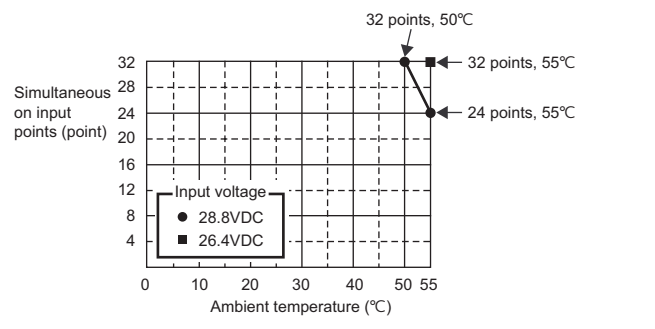
^{*1} This function is intended to protect the internal circuit of a module, not to protect external devices. Additionally, an abnormal load can cause the module internal temperature to rise, resulting in deterioration of the output elements and discoloration of the case and printed-circuit board. In the event of an abnormal load, turn off the corresponding output immediately and eliminate the cause.

^{*2} This operation limits an overcurrent to a certain current value, which allows a continuous output.

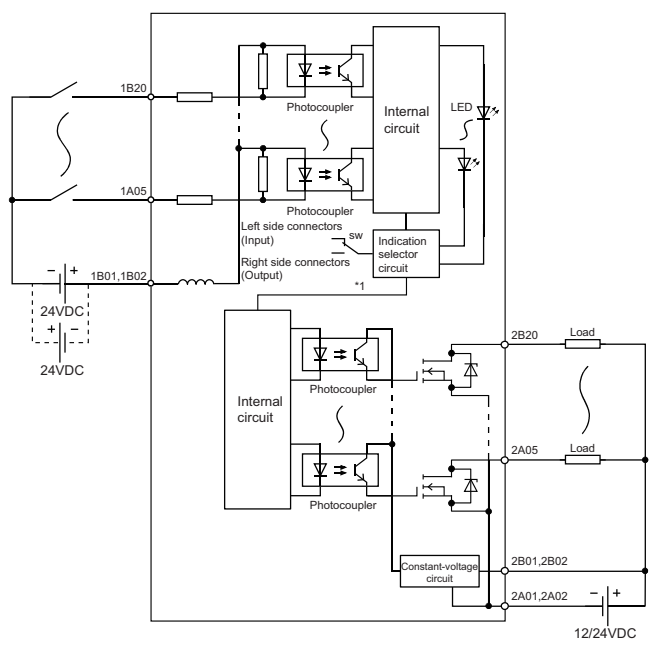
RH42C4NT2P DC input/transistor output combined module (sink type)

Item		Specifications	Appearance
■ Input specifications			
Number of input points		32 points	
Rated input voltage		24VDC (ripple ratio: within 5%) (allowable voltage range: 20.4 to 28.8VDC)	
Rated input current		4.0mA TYP. (at 24VDC)	
ON voltage/ON current		19V or higher/3mA or higher	
OFF voltage/OFF current		6V or lower/1.0mA or lower	
Input resistance		5.3kΩ	
Response time		 Page 32 Input response time	
Wiring method for common		32 points/common (common terminal: 1B01, 1B02)	
Interrupt function		Available (can be set in the parameters of the CPU module)	
■ Output specifications			
Number of output points		32 points	
Rated load voltage		12/24 VDC (allowable voltage range: 10.2 to 28.8VDC)	
Maximum load current		0.2A/point, 2A/common	
Maximum inrush current		Current is to be limited by the overload protection function.	
Leakage current at OFF		0.1mA or lower	
Maximum voltage drop at ON		0.2VDC (TYP.) 0.2A, 0.3VDC (MAX.) 0.2A	
Response time	OFF→ON	0.5ms or less	
	ON→OFF	1ms or less (rated load, resistive load)	
Surge suppressor		Zener diode	
Fuse		None	
External power supply	Voltage	12/24VDC (ripple ratio: within 5%) (allowable voltage range: 10.2 to 28.8VDC)	
	Current	16mA (at 24VDC)/common	
Wiring method for common		32 points/common (common terminal: 2A01, 2A02)	
Protection functions	Overload protection	Limit current with overload protection at overcurrent detection: 1 to 3A/point Activated in increments of 1 point. ( Page 30 I/O combined module)	
	Overheat protection	Activated in increments of 1 point. ( Page 30 I/O combined module)	
■ Common specifications			
Withstand voltage		510VACrms, 1 minute	
Insulation resistance		10MΩ or higher by insulation resistance tester	
Noise immunity		Simulator noise 500Vp-p, noise width 1μs By noise simulator of 25 to 60Hz noise frequency	
Protection degree		IP2X	
Number of occupied I/O points		32 points (I/O assignment: I/O combined 32 points)	
External connections		40-pin connector  Page 47 40-pin connector type module	
Internal current consumption (5VDC)		220mA (TYP. all points ON)	
Weight		0.13kg	

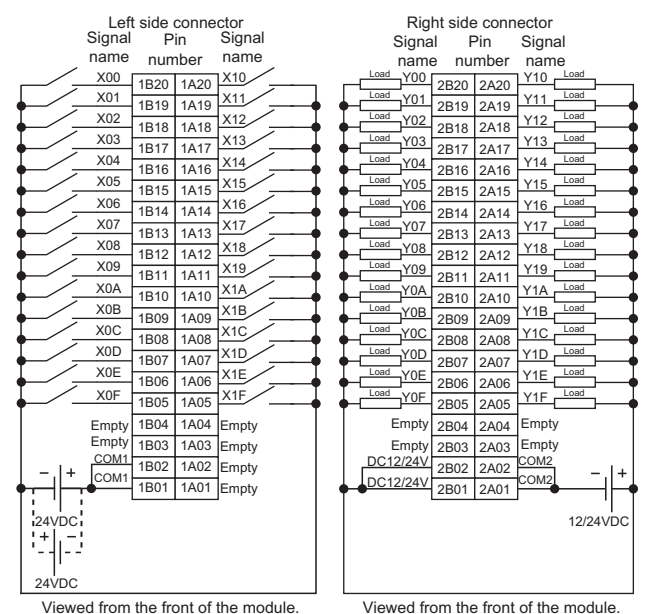
Derating chart (input circuit)



Circuit configuration



Terminal connection




*1 The LED indicates the input (X00 to X1F) by turning the switch to the left (F), while the LED indicates the output (Y00 to Y1F) by turning the switch to the right (L).

■ Input response time

Timing	Setting value								
	0.1ms	0.2ms	0.4ms	0.6ms	1ms	5ms	10ms	20ms	70ms
OFF→ON (MAX)	0.1ms	0.2ms	0.4ms	0.6ms	1ms	5ms	10ms	20ms	70ms
ON→OFF (MAX)	0.2ms	0.3ms	0.5ms	0.7ms	1ms	5ms	10ms	20ms	70ms

Blank cover module

RG60 blank cover module


Item		Specifications	Appearance
Number of occupied I/O points		Default: 16 points (can be changed to 0, 16, 32, 48, 64, 128, 256, 512, or 1024 points in the I/O assignment setting of the system parameters)	
Application		Used for dust prevention in the space where an I/O module is not mounted (especially the empty slot between modules).	
External dimensions	Height	106mm	
	Width	27.8mm	
	Depth	110mm	
Weight		0.07kg	
—		—	



Mount the blank cover module with the connector cover of the base unit attached.

3.2 Function List

This section lists the functions of the I/O module.

Item	Description	Reference
Input response time setting	Allows changing the input response times of input modules on a module-by-module basis. The input modules take in external input for the set input response time.	Page 53 Input Response Time Setting
Interrupt input function	Generates an interrupt from an input module.	Page 54 Interrupt Input Function
In-error output mode setting	Allows selection of whether the CPU module clears or holds output to the output module and intelligent function module when a stop error occurs.	Page 55 In-Error Output Mode Setting
Output ON number count function	Counts the number of ON times for each output point within the range of 0 to 4294967295. The integration value is held even if the output module is powered off.	Page 56 Output ON Number Count Function
Inter-module synchronization function	Synchronizes input and output with multiple modules on which the inter-module synchronization function is enabled.	 MELSEC iQ-R Inter-Module Synchronization Function Reference Manual

3.3 Buffer Memory


The buffer memory in the I/O module consists of only system areas. Reading/writing data from/to the system areas may cause malfunction.

4 PROCEDURES BEFORE OPERATION

This chapter describes the procedures before operation.


1. Mounting a module

Mount the I/O module in any desired configuration.

 Page 37 SYSTEM CONFIGURATION


2. Wiring

Perform wiring of external devices to the I/O module.

 Page 46 Wiring

3. Adding a module

Add the I/O module to a module configuration by using the engineering tool. For details, refer to the following.

 GX Works3 Operating Manual


4. Module settings

Perform various settings of the module by using the engineering tool.

 Page 49 PARAMETER SETTINGS

5. Programming

Create a program.

 GX Works3 Operating Manual

MEMO

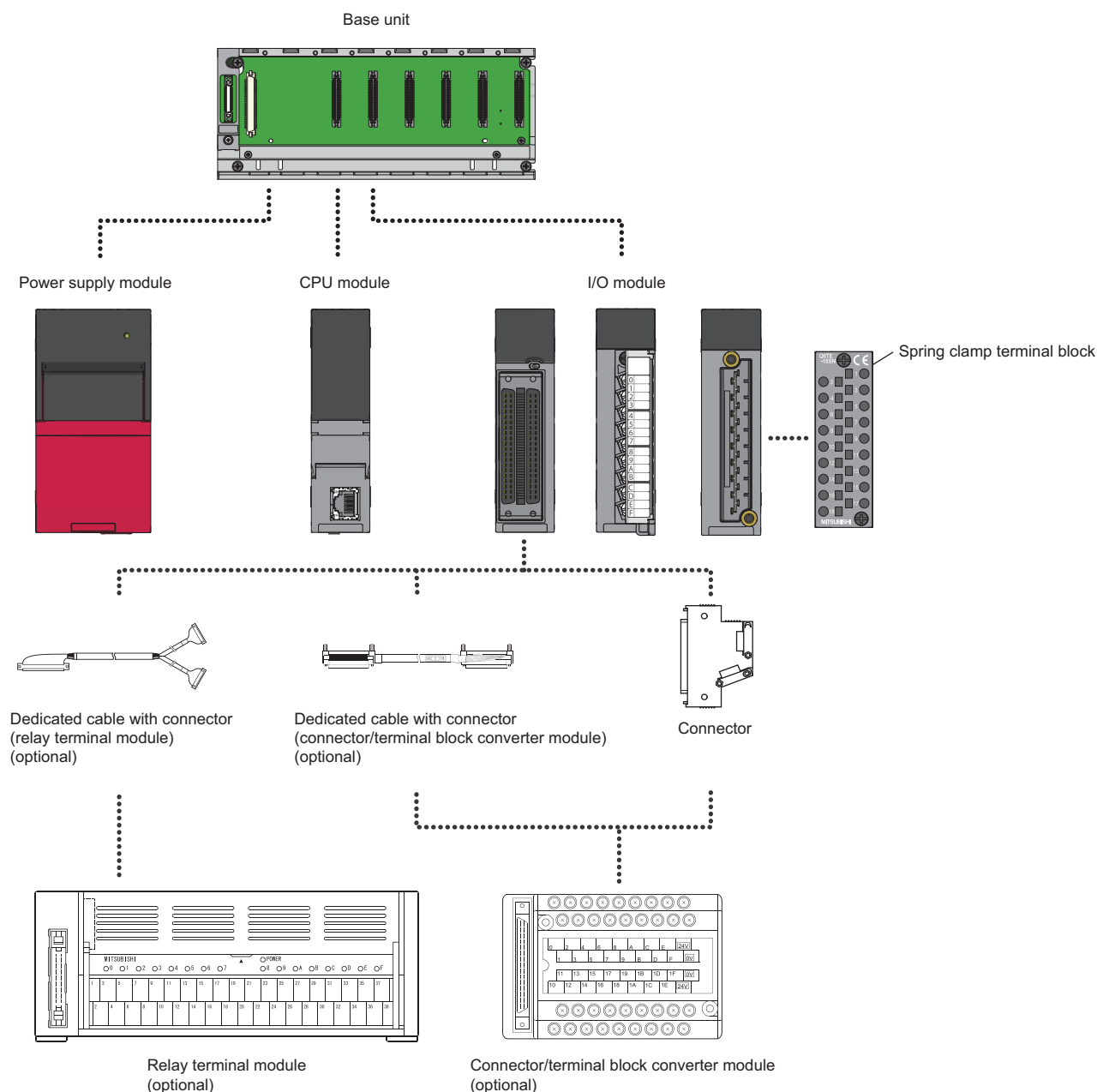
5 SYSTEM CONFIGURATION

This chapter describes the system configuration of the I/O module.

5.1 System Configuration

System configuration example when I/O modules are used

The following figure shows an example of the system configuration when I/O modules are used.



Recommended optional items

To perform the module wiring easier, the following products are prepared as optional items.

■Connector/terminal block converter module and dedicated cable with connector

Used for the easy wiring from a connector type I/O module to an external wiring terminal block.

 Page 64 Connector/terminal block converter modules

■Relay terminal module and dedicated cable with connector

Used as a substitute for the relay terminal blocks and relays in a control panel, which reduces the man-hours for wiring among the programmable controllers, relay terminal blocks, and relays.


For details on the relay terminal module and dedicated cable with connector, refer to the following.

 Relay Terminal Module User's Manual (Hardware) A6TE2-16SRN

■Spring clamp terminal block

Used by mounting it on a terminal block type I/O module. The man-hours for wiring can be reduced considerably because the screw tightening is not required in wiring.

For details on the spring clamp terminal block, refer to the following.

 Before Using the Product (BCN-P5999-0209)

5.2 Applicable Systems

Compatible software version

To ensure compatibility of the software version, always update GX Works3 to the latest version.

6 INSTALLATION AND WIRING

This chapter describes the installation and wiring of the I/O modules.

6.1 Before Using the I/O Modules

Input modules

Precautions common to all input modules

■Number of simultaneous ON points

The number of input points that can be turned on at the same time varies depending on the input voltage and ambient temperature. For details, refer to the derating chart of the specifications of each input module.

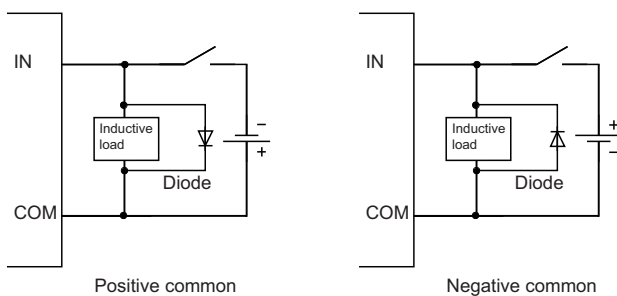
📖 Page 16 SPECIFICATIONS

Precautions when using the DC input module

■Measures against back EMF

When connecting an inductive load, connect a diode in parallel with the load. Use the diode that satisfies the following conditions:

- A reverse breakdown voltage is more than ten times as high as the circuit voltage.
- A forward current is more than twice as high as the load current.



Output modules

Precautions common to all output modules

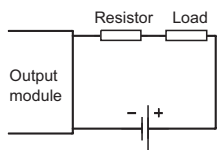
■Maximum switching frequency when L load is driven

The maximum switching frequency imposes a limit on the use; an ON state or an OFF state must not be changed without an interval of at least one second.

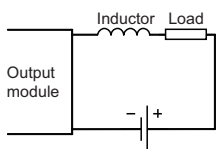
■Load to be connected

When connecting a counter or timer utilizing a DC-DC converter as a load of the output module, select an output module whose maximum load current is higher than the inrush current of a load to be connected. If the selection is based on the average current of a load, an inrush current flows cyclically from the load while the output module is in an ON state or in operation, which can cause failure of the module. If necessary to select a module on the basis of the average current, to alleviate the effect of the inrush current, take any of the following corrective actions:

- Connecting a resistor in series with the load



- Connecting an inductor in series with the load



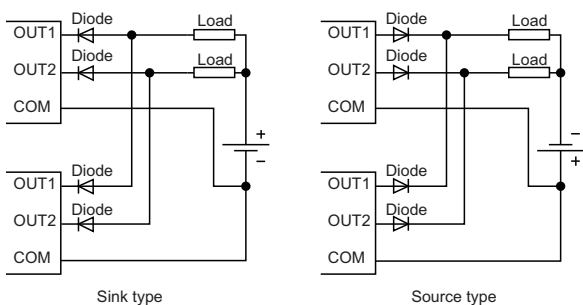
Precautions when using the transistor output module

■Measures against reverse current

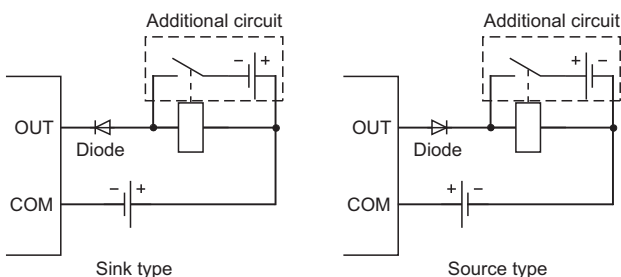
In the following connections, a reverse current flows to the output element, which can cause failure.

When wiring, set up diodes as the following figures show:

- When connecting transistor output modules in parallel



- When providing another circuit in parallel with a transistor output module

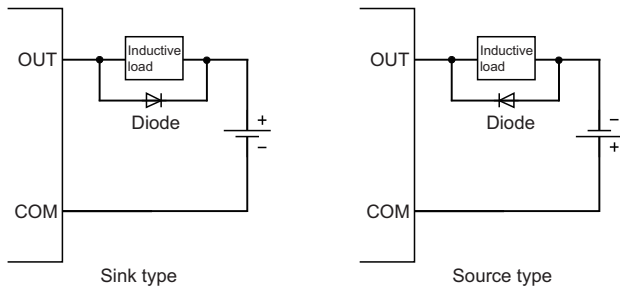


■ Measures against back EMF

When connecting an inductive load, connect a diode in parallel with the load.

Use the diode that satisfies the following conditions:

- A reverse breakdown voltage is more than ten times as high as the circuit voltage.
- A forward current is more than twice as high as the load current.



■ About element protection of the output module

If excessive noise affects the terminals of the output module, the output may be turned on to help the protection of the output element. Adjust the voltage between terminals of the output module to fall within the operating load voltage range by take measures such as the following:

- To use an inductive load such as a relay, a surge suppressor is required on the load side as well. Take appropriate measures with the measures against back EMF as a guide. (👉 Page 41 Measures against back EMF)
- To prevent excessive noise, avoid installing power cables together with I/O cables.

Precautions when using the contact output module

When using the contact output module, carefully consider the following points:

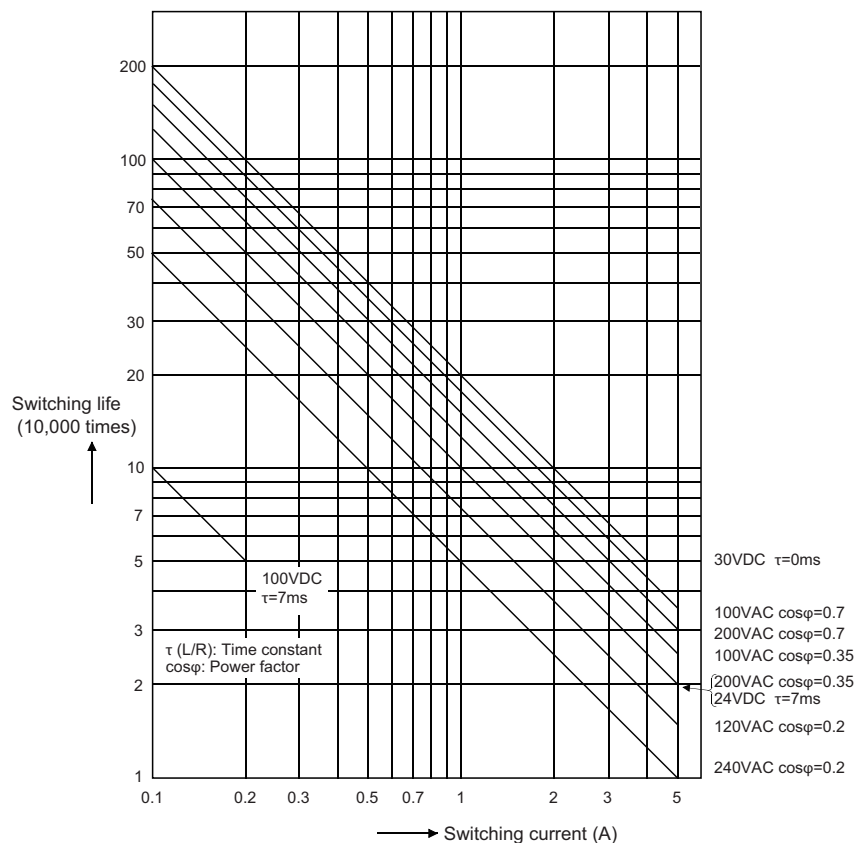
- Relay life (contact switching life)
- Influence on the relay life by a connected load
- Measures against back EMF

■ Relay life (contact switching life)

Applicable module.....RY10R2

The relay life varies depending on the environment where a module is used. When using a module, take the use environment into consideration.

The relay life curve below shows the actual service values, not the guaranteed values. Since an actual contact switching life may be shorter than the relay life curve, replace the module with a sufficient margin for the life.



Use environment	Contact switching life
Rated switching voltage/current load	100 thousand times
1.5A at 200VAC, 1A at 240VAC (COSφ = 0.7)	100 thousand times
0.4A at 200VAC, 0.3A at 240VAC (COSφ = 0.7)	300 thousand times
1A at 200VAC, 0.5A at 240VAC (COSφ = 0.35)	100 thousand times
0.3A at 200VAC, 0.15A at 240VAC (COSφ = 0.35)	300 thousand times
1A at 24VDC, 0.1A at 100VDC (L/R = 7ms)	100 thousand times
0.3A at 24VDC, 0.03A at 100VDC (L/R = 7ms)	300 thousand times

■Influence on the relay life by a connected load

An actual relay life can be substantially shorter than the relay life curve depending on the type of a connected load and the characteristics of its inrush current.

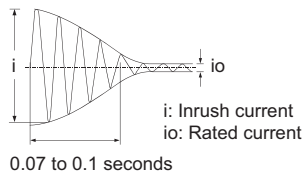
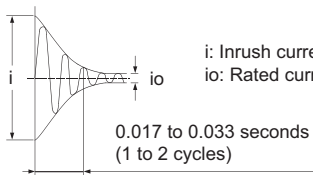
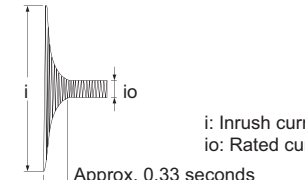
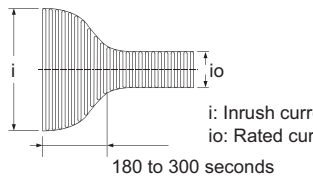
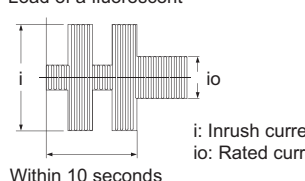
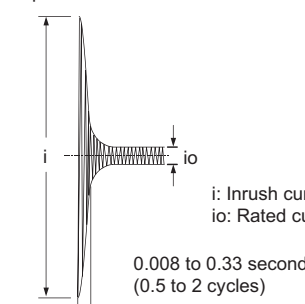
☞ Page 42 Relay life (contact switching life)

The inrush current generated by a connected load can lead to contact welding of the module. To prevent shortening of the relay life and contact welding, take the following measures:

- Considering the possibility of a high inrush current, select a load so that the inrush current generated by the connected load falls within the range of the rated current of the module.
- Connect a relay capable of withstanding the inrush current, outside the module.

The following table lists the relations between typical loads and each inrush current.

Select a load so that the inrush current, i , and rated current, i_o , fall within the range of the rated switching current described in the module specifications. In some loads, the inrush current flows for a long time.

Load type	Waveform	Inrush current i /rated current i_o	Waveform	Inrush current i /rated current i_o
Inductive load	Load of a solenoid  i : Inrush current i_o : Rated current 0.07 to 0.1 seconds	Approx. 10 to 20 times	Load of an electromagnetic contactor  i : Inrush current i_o : Rated current 0.017 to 0.033 seconds (1 to 2 cycles)	Approx. 3 to 10 times
Lamp load	Load of an incandescent bulb  i : Inrush current i_o : Rated current Approx. 0.33 seconds	Approx. 3 to 10 times	Load of a mercury lamp  i : Inrush current i_o : Rated current 180 to 300 seconds (3 to 5 minutes)	Approx. 3 times ^{*1}
	Load of a fluorescent  i : Inrush current i_o : Rated current Within 10 seconds		—	
Capacitive load	Capacitive load ^{*2}  i : Inrush current i_o : Rated current 0.008 to 0.33 seconds (0.5 to 2 cycles)	Approx. 20 to 40 times	—	—

^{*1} A typical discharge lamp circuit is configured with a combination of discharge tubes, transformers, choke coils, capacitors and others. Because of this, be especially careful of the case of a high power factor and a low power supply impedance, where the inrush current flowing into the output module can be 20 to 40 times as high as the rated current.

^{*2} When the wiring is long, be careful with the cable capacity as well.

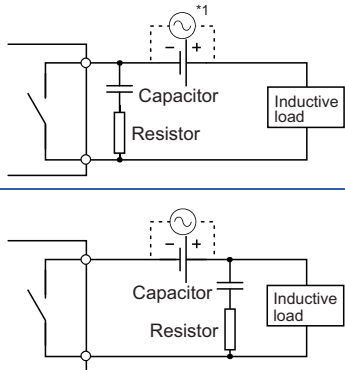
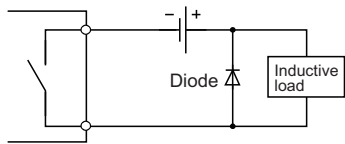
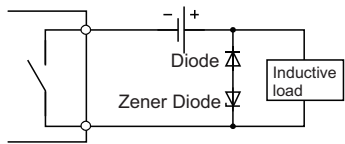
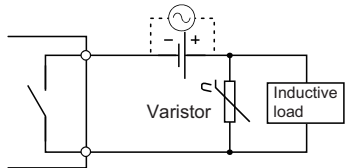
■Measures against back EMF

Provide a contact protection circuit for an extended contact life, noise prevention at contact close, and reduction of the carbides and nitric acids formed by an arc discharge.

An incorrect circuit involves a high risk of contact welding.

With the contact protection circuit, the recovery time may be delayed.

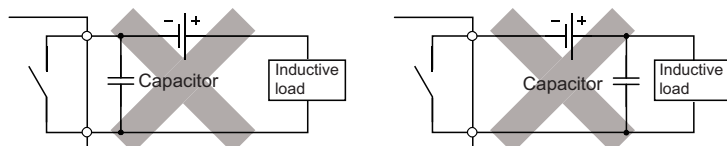
The following table shows typical examples of the contact protection circuit.

Circuit example	Element selection criteria	Remarks
Capacitor + resistance method (CR method) 	Estimate the constants of a capacitor and resistance with the following as a guide. Some differences, however, may arise from a variation in the nature and characteristics of the load. <ul style="list-style-type: none"> Capacitor: 0.5 to 1 (μF) for a load current of 1A Resistance: 0.5 to 1 (Ω) for a power supply voltage of 1V Use a capacitor whose withstand voltage is higher than the rated voltage. In an AC circuit, use a capacitor with no polarity.	When a relay or solenoid is used as the load, the recovery time is delayed. A capacitor has the effect of reducing a discharge at contact OFF, while a resistance has the effect of limiting a current at contact ON.
Diode method 	Use a diode that satisfies the following conditions: <ul style="list-style-type: none"> A reverse breakdown voltage is more than ten times as high as the circuit voltage. A forward current is more than twice as high as the load current. 	The recovery time is delayed than the CR method.
Diode + zener diode method 	Use a zener diode whose zener voltage is higher than the power supply voltage.	This method is suitable for the case where the diode method results in a substantial delay in the recovery time.
Varistor method 	Select a varistor whose cut-off voltage (V_c) satisfies the following conditions: <ul style="list-style-type: none"> $V_c > \text{power supply voltage} \times 1.5 \text{ (V)}$ $V_c > \text{power supply voltage} \times 1.5 \text{ (V)} \times \sqrt{2}$ (on AC power supply) Note that selecting an element of a too high V_c leads to a weaker effect.	The recovery time is a little delayed.

*1 On AC power supply, the impedance of the CR needs to be sufficiently higher than that of the load (for preventing errors due to the leakage current of the CR).

Point

- Avoid using contact protection circuits like the following. Although highly effective in reducing the arc at current cutoff, a charge current flows into the capacitor when the contact turns on or off, which leads to the risk of contact welding. A DC inductive load, generally considered to be more difficult to open and close than a resistive load, can achieve the same performance of a resistive load in an appropriate configuration of the protection circuit.



- Install the protection circuit near the load or contact (module). A long distance between them may inhibit the effect of the protection circuit. As a guide, install it at a distance of no more than 50cm.

I/O combined module

This section describes the precautions specific to the I/O combined module.
The precautions other than the following are the same as the input module and output module. (☞ Page 39 Input modules, Page 40 Output modules)

I/O numbers of the I/O combined module

The I/O combined module assigns the same I/O number to each input and output.
The same number for the input number and output number saves the I/O numbers in use.

Input (X)	Output (Y)
X00	Y00
⋮	⋮
X1F	Y1F

32 points

6.2 Wiring

18-point screw terminal block type module

Precautions

- When wiring the terminal block, be sure to use a solderless terminal with a width of 0.8mm or less. In addition, one terminal part allows connection of up to two solderless terminals.
- A solderless terminal with an insulation sleeve cannot be used for the terminal block. To prevent a short-circuit due to a loose terminal block screw, coating the wire connection part with a mark tube or insulation tube is recommended.
- For the wire to be connected to the terminal block, use the following.


Applicable wire size	Material	Temperature rating
0.3 to 0.75mm ² (22 to 18 AWG) (stranded wire) Outside diameter: 2.8mm or less	Copper	75°C or greater

- Use the UL listed solderless terminal, R1.25-3.
- Tighten the terminal block screws within the following specified torque range.

Screw	Tightening torque range
Terminal screw (M3)	0.42 to 0.58N·m
Terminal block mounting screw (M3.5)	0.66 to 0.89N·m

Wiring method, installation procedure, and removal procedure of the terminal block

For the wiring method, installation procedure, and removal procedure, refer to the following.

 MELSEC iQ-R Module Configuration Manual

40-pin connector type module

Precautions

- Use copper wire with a temperature rating of 75°C or higher for the connector.
- Tighten the connector screws within the following specified torque range.

Screw	Tightening torque range
Connector screw (M2.6)	0.20 to 0.29N·m

Applicable connectors

40-pin connectors to be used for an input module, output module, and I/O combined module are sold separately.

The following table lists the applicable connectors and models, and the reference products of a crimping tool and pressure-displacement tool.

■40-pin connectors

Type	Model	Applicable wire size
Soldering type connector (straight type)	A6CON1*1	0.088 to 0.3mm ² (28 to 22 AWG) (stranded wire)
Crimping type connector (straight type)	A6CON2	0.088 to 0.24mm ² (28 to 24 AWG) (stranded wire)
IDC type connector (straight type)	A6CON3	28 AWG (stranded wire) 30 AWG (solid wire) 1.27mm pitch flat cable
Soldering type connector (dual purpose (straight/oblique) type)	A6CON4*1	0.088 to 0.3mm ² (28 to 22 AWG) (stranded wire)

*1 Use wire with a sheath outside diameter of 1.3mm or less when using the 40 pins. Select appropriate cables according to the current value used.

■40-pin connector crimping tool and pressure-displacement tool

Type	Model	Contact
Crimping tool	FCN-363T-T005/H	FUJITSU COMPONENT LIMITED
Pressure-displacement tool	FCN-367T-T012/H (locator plate)	
	FCN-707T-T001/H (cable cutter)	
	FCN-707T-T101/H (hand press)	

For how to wire the connector and how to use the crimping tool and pressure-displacement tool, contact the manufacturer.

Wiring method, installation procedure, and removal procedure of the connectors

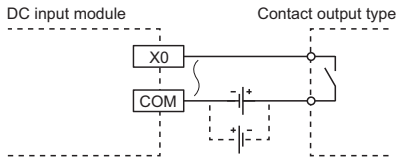
For the wiring method, installation procedure, and removal procedure, refer to the following.

📖 MELSEC iQ-R Module Configuration Manual

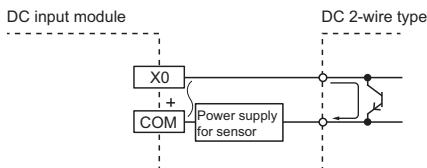
6.3 Input Wiring Examples

The following figures show examples of wiring between the DC input module and connectable DC input devices (DC output type).

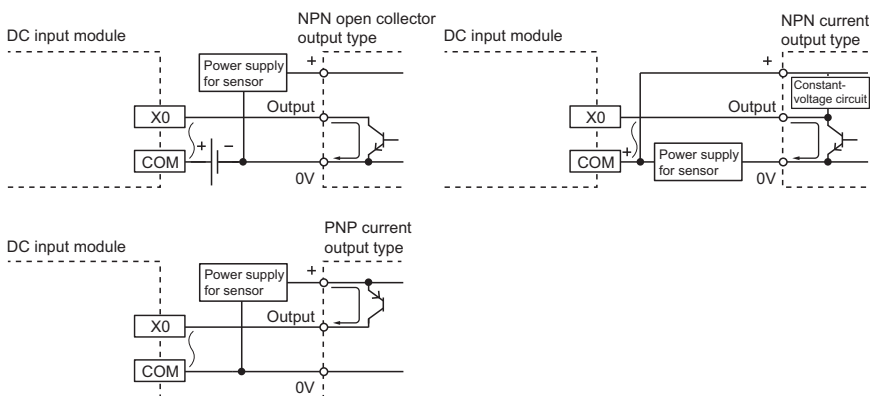
Wiring example for contact output type



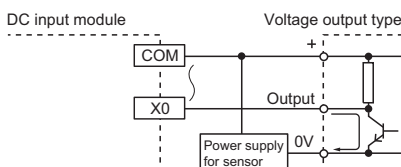
Wiring example for DC 2-wire type



Wiring example for transistor output type



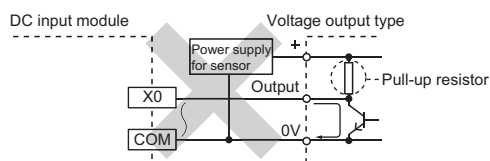
Wiring example for voltage output type



Point

When connecting to the voltage output type sensor, avoid the wiring as shown below.

In the wiring below, a current flows into the DC input module through the pull-up resistor in the sensor. As a result, an input current may not reach the ON current of the DC input module, which does not change the input signal to an ON state.



7 PARAMETER SETTINGS

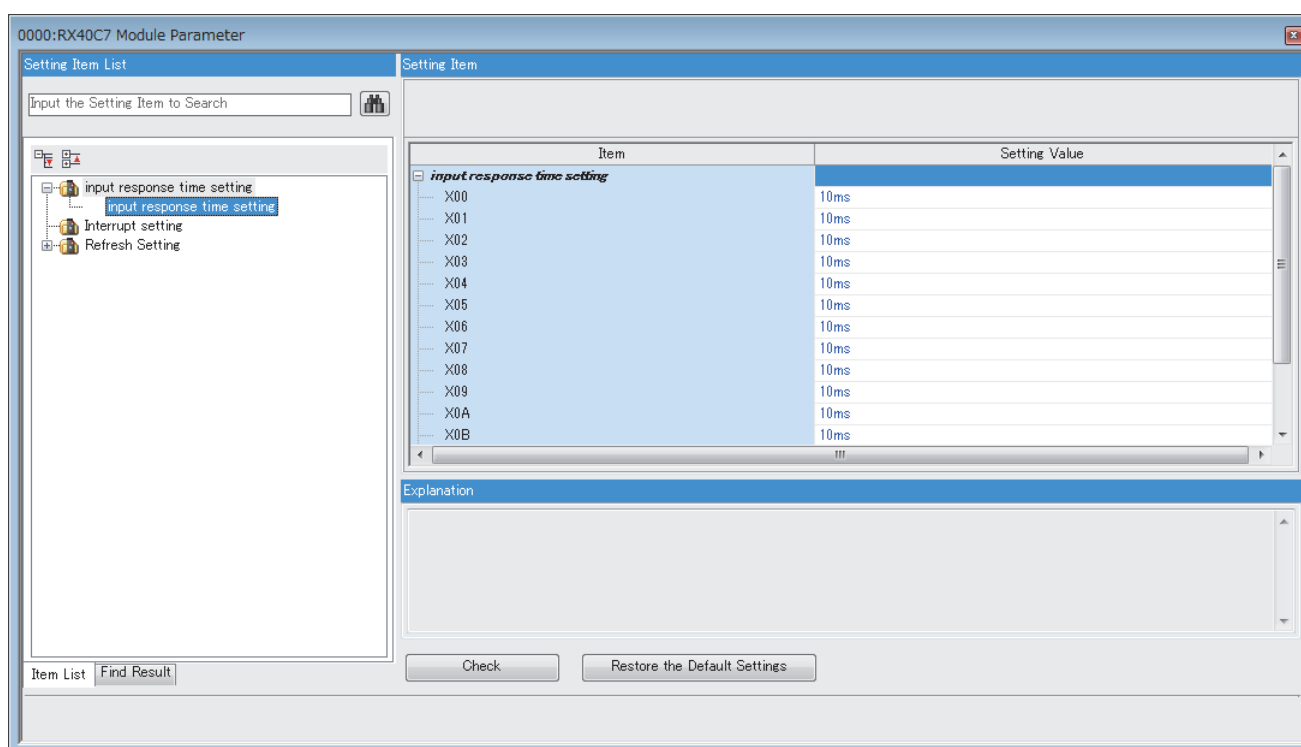
This chapter describes the parameter settings of the I/O modules. Setting parameters here eliminates the need to program them.

7.1 Parameter Setting Procedure

1. Add the I/O module to the setting in the engineering tool.
 ⚙ Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Right-click ⇒ [Add New Module]
2. The parameter setting consists of four items: the input response time setting, interrupt function setting, setting of error-time output mode, and refresh setting. Select these items from the tree window below to set them.
 ⚙ Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter]
3. Write the setting into the CPU module using the engineering tool.
 ⚙ [Online] ⇒ [Write to PLC]
4. Reset the CPU module or turn off and on the power to reflect the setting.

Input response time setting

Set the input response time setting (cannot be set for the AC input module).



Item		Setting range	Reference
Input response time setting	X00 to X3F	<ul style="list-style-type: none"> • 0.1ms • 0.2ms • 0.4ms • 0.6ms • 1ms • 5ms • 10ms • 20ms • 70ms 	Page 53 Input Response Time Setting

Interrupt function setting

Set the interrupt function for the input module.

0000:RX40C7 Module Parameter

Setting Item List

input response time setting

Interrupt setting

Refresh Setting

Setting Item

No.	input/interrupt setting	interrupt condition settin	interrupt pointer
1	input	leading edge	
2	input	leading edge	
3	input	leading edge	
4	input	leading edge	
5	input	leading edge	
6	input	leading edge	
7	input	leading edge	
8	input	leading edge	
9	input	leading edge	
10	input	leading edge	
11	input	leading edge	
12	input	leading edge	
13	input	leading edge	
14	input	leading edge	

Explanation

Set an input signal for input or interrupt.

Item List

Find Result

Check

Restore the Default Settings

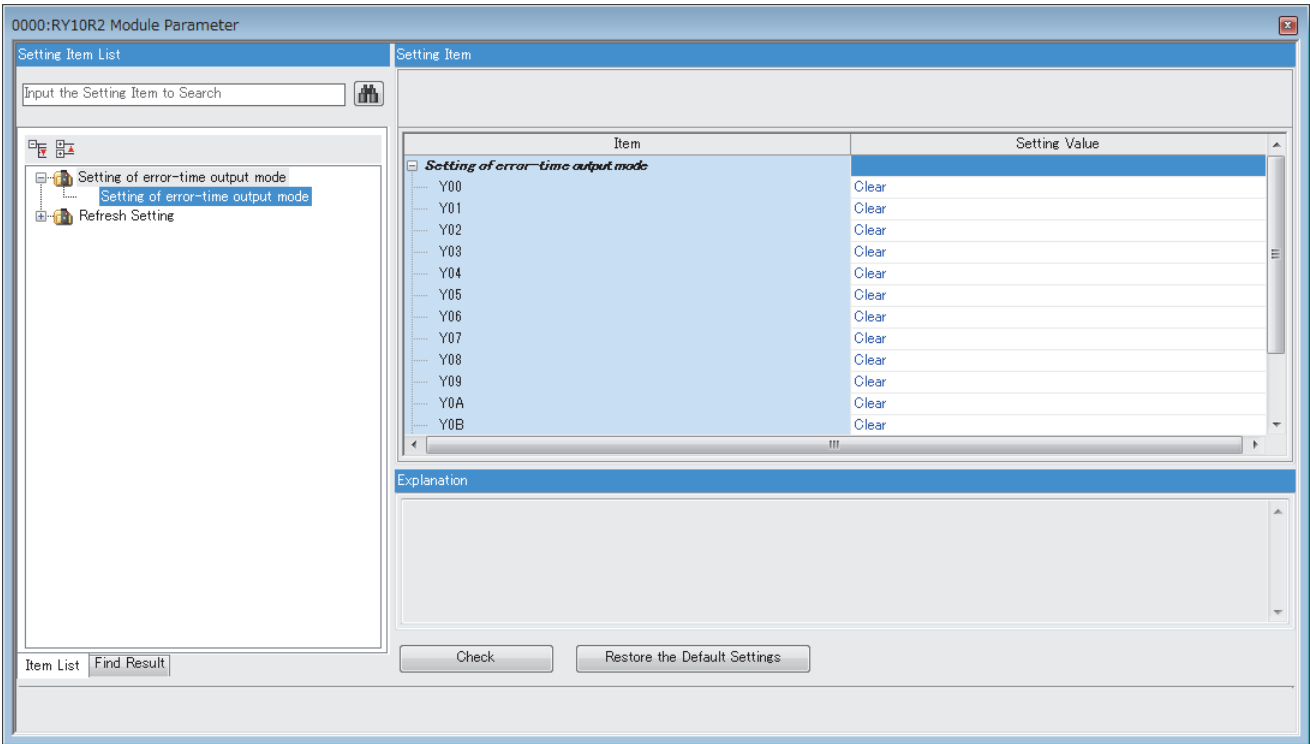
Item	Setting range	Reference
Input/interrupt setting	<div><div>• Input</div><div>• Interrupt</div></div>	Page 54 Interrupt Input Function
Interrupt condition setting	<div><div>• Leading edge</div><div>• Trailing edge</div><div>• Leading edge/trailing edge</div></div>	
Interrupt pointer	I0 to I15, I50 to I1023**1	

*1 For details on the available interrupt pointers, refer to the following.

MELSEC iQ-R CPU Module User's Manual (Application)

Setting of error-time output mode

Set the in-error output setting.

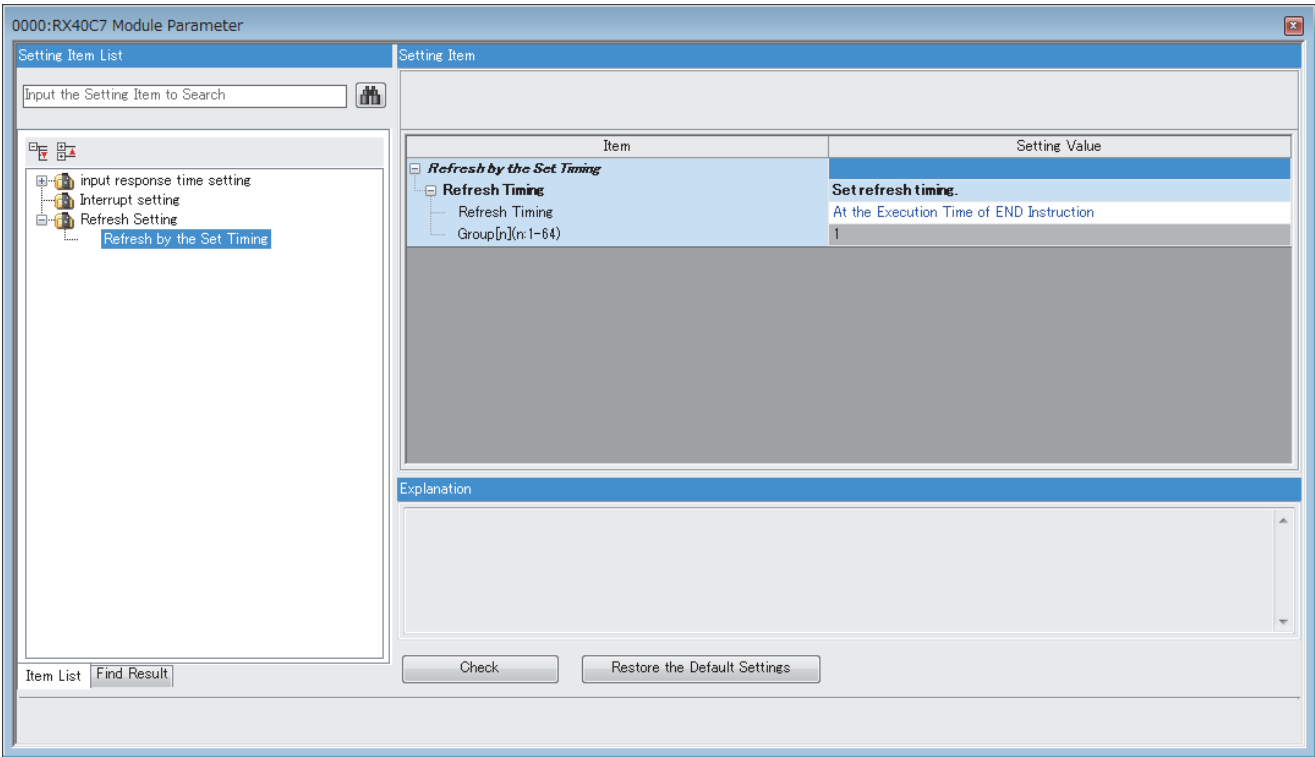


7

Item		Setting range	Reference
Setting of error-time output mode	Y0 to Y3F	<ul style="list-style-type: none">• Clear• Hold	Page 55 In-Error Output Mode Setting

Refresh setting

Set the refresh timing of the refresh destination specified.

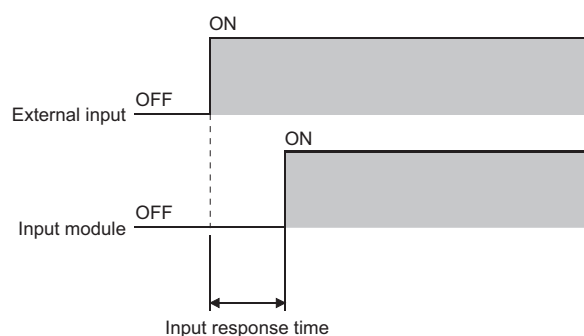


Setting value	Description
At the Execution Time of END instruction	Refresh takes place at the time of the END processing of the CPU module.
At the execution time of specified program	Refresh takes place at the time of the execution of the program specified in "Group[n]".

8 FUNCTIONS


8.1 Input Response Time Setting

This function allows changing the input response times of input modules on a module-by-module basis. The input modules take in external input for the set input response time.



Setting method

Set the input response time from "input response time setting".

 Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ "input response time setting" ⇒ "input response time setting"

■Pulse width to be taken in as input

Input modules may take in noise and others as input because of the setting of an input response time.

The pulse width to be taken in as input varies depending on the response time set in parameters.

Set an input response time with due consideration for the use environment.

The following table lists the minimum value of each pulse width that may be taken in as input. The pulse width to be ignored as noise should be less than the following minimum values:

Input response time setting value	0.1ms	0.2ms	0.4ms	0.6ms	1ms	5ms	10ms	20ms	70ms
Minimum value of the pulse width that may be taken in as input (maximum value of the pulse width to be ignored as noise)	0.02ms	0.07ms	0.1ms	0.4ms	0.5ms	2ms	4ms	9ms	35ms

8.2 Interrupt Input Function

This function generates an interrupt from an input module.

Operation

An interrupt operation depends on the condition set in module parameters. In addition, an interrupt condition can be set for each point.


When "Interrupt condition setting" is set to "Leading edge/trailing edge", an interrupt factor occurred during execution of an interrupt program is held only once, and the second and subsequent factors are ignored.

If "fall → rise" occurs during execution of an interrupt program to be triggered by a rising edge, the second rising edge does not trigger the interrupt program. Because of this, provide an interval between on and off of the interrupt input (also same as "fall → rise → fall").

In addition, a continuous interrupt input of signals with a short ON width and OFF width causes frequent halts of the main routine program. Adjust the ON width and OFF width for interrupt input not to interfere with the execution of the main routine program.

Setting method

Set the interrupt method from "Interrupt setting".


 Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ "Interrupt setting"

8.3 In-Error Output Mode Setting

This setting allows selection of whether the CPU module clears or holds output to the output module and intelligent function module when a stop error occurs.

Setting method

Set the output method from "Setting of error-time output mode".

 Navigation window ⇒ [Parameter] ⇒ [Module Information] ⇒ Module model name ⇒ [Module Parameter] ⇒ "Setting of error-time output mode" ⇒ "Setting of error-time output mode"


8.4 Output ON Number Count Function

This function counts the number of ON times for each output point of the contact output module within the range of 0 to 4294967295. The count value is held even if the output module is powered off.

Checking the number of ON times

Check the number of output ON times by using the FB that notifies the comparison result of an integration value of the number of relay ON times.

For details on the function block (FB), refer to the following.

 MELSEC iQ-R I/O Module Function Block Reference

9 TROUBLESHOOTING

9.1 Troubleshooting

The RUN LED is not on.

Check item	Action
Check whether power is supplied to the power supply module.	Check that the supply voltage to the power supply module is within the rated range.
Check whether the capacity of the power supply module is enough.	Calculate the current consumption of mounted modules, such as the CPU module, I/O modules, and intelligent function modules to check that the power capacity is enough.
Check whether the module is mounted properly.	Check the mounting state of the module.
Cases other than the above	Reset the CPU module and check if the RUN LED turns on. If the RUN LED still remains off, the possible cause is a failure of the module. Please consult your local Mitsubishi representative.

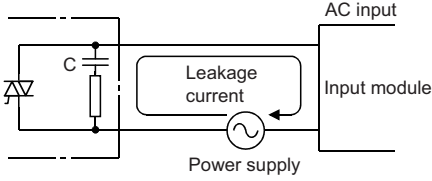
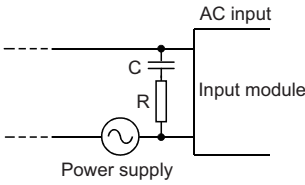
The I/O status indicator LED is not on.

Check item	Action
Check whether external power supply is supplied to the I/O module.	Check that the supplied power meets the voltage specifications of the I/O module used.
Try forced on on the device concerned by using the engineering tool.	Perform forced on/off on the device concerned to check the correspondence between the device state and the I/O indicator LED. If the error of the I/O indicator LED still persists, the possible cause is a failure of the module. Please consult your local Mitsubishi representative.

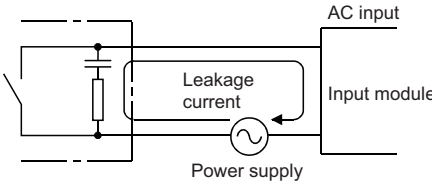
9.2 Input Circuit Troubles and Corrective Actions

An input signal does not turn off.

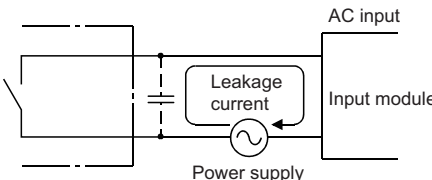
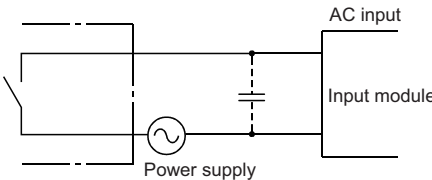
■Case 1

Cause	<p>There is a leakage current from the input switch (driven by a contactless switch and others).</p> 
Action	<p>Connect an appropriate resistor so that the voltage between terminals of the input module would fall below the OFF voltage.</p>  <p>The recommended CR constant is as follows: 0.1 to 0.47μF + 47 to 120Ω (1/2W).</p>

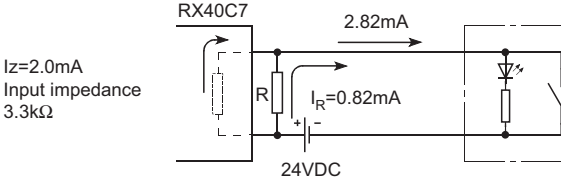
■Case 2

Cause	<p>There is a leakage current from the input switch (driven by a limit switch with neon lamp).</p> 
Action	<p>Take any of the following actions:</p> <ul style="list-style-type: none"> • Connect an appropriate resistor so that the voltage between terminals of the input module would fall below the OFF voltage. (same action as the case 1). • Make the circuit independent and provide another display circuit.

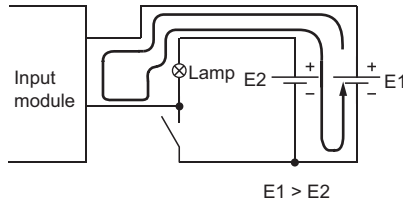
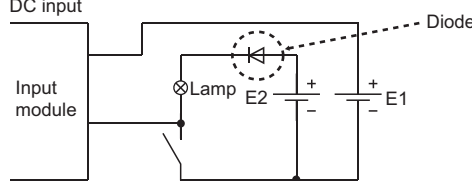
■Case 3

Cause	<p>There is a leakage current due to the line capacity of the wiring cables. (The line capacity, C, of a twisted pair cable is as follows: C = approx. 100pF/m.)</p> 
Action	<p>Connect an appropriate resistor so that the voltage between terminals of the input module would fall below the OFF voltage. (same action as the case 1).</p> <p>A leakage current is not generated, however, where the power supply lies in the input device side like the figure below:</p> 

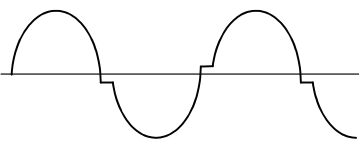
Case 4

Cause	Even if the switch with LED indicator is turned off, there is a leakage current rising above the OFF current of the input module.
Action	<p>Connect an appropriate resistor so that the current flowing into the input module would fall below the OFF current.</p>  <p>$I_Z = 2.0\text{mA}$ Input impedance $3.3\text{k}\Omega$</p> <p>24VDC</p>
Calculation example	<p>This column gives a calculation example of the resistance value of a resistor to be connected.</p> <p>■ Assuming that a switch with LED indicator where a leakage current of 2.82mA flows by applying a 24VDC power supply is connected to the RX40C7</p> <p>Check the following items referring to the specifications of the module.</p> <ul style="list-style-type: none"> • OFF current: 2.0mA • Input resistance: 3.3kΩ <p>I (Leakage current) = I_Z (Off current of the RX40C7) + I_R (Current flowing to connected resistor)</p> <p>$I_R = I - I_Z = 2.82 - 2.0 = 0.82$ [mA]</p> <p>To satisfy the condition that an OFF current of the RX40C7 should be lower than 2.0mA, connect a resistor R through which a current of more than 0.82mA will flow. The resistance value, R, of a resistor to be connected is given by the following:</p> <p>$I_R: I_Z = Z$ (Input impedance): R</p> $R \leq \frac{I_Z}{I_R} \times Z \text{ (Input impedance)} = \frac{2.0}{0.82} \times 3.3 = 8.05 \text{ [k}\Omega\text{]}$ <p>→ The obtained result is: Resistance value $R < 8.05\text{k}\Omega$.</p> <p>[Checking the connected resistor by calculating power capacity]</p> <p>If the resistance R is 6.8kΩ, the power capacity, W, of the resistance R is given by the following:</p> $W = \frac{(\text{Input voltage})^2}{R} = \frac{28.8^2}{6.8 \text{ [k}\Omega\text{]}} = 0.122 \text{ [W]}$ <p>Because the power capacity of a resistor needs to be 3 to 5 times as large as the actual current consumption, a resistor to be connected to the terminal concerned should be 8.2kΩ and 1/2W.</p> <p>In addition, when the resistance R is inserted, the OFF voltage is given by the following:</p> $\frac{1}{\frac{1}{6.8 \text{ [k}\Omega\text{]}} + \frac{1}{3.3 \text{ [k}\Omega\text{]}}} \times 2.82 \text{ [mA]} = 6.27 \text{ [V]}$ <p>This value, therefore, satisfies the condition that an OFF voltage of the RX40C7 should be lower than 8V.</p>

Case 5

Cause	<p>There is a sneak path allowing current to flow because of the use of two power supplies.</p>  <p>$E1 > E2$</p>
Action	<ul style="list-style-type: none"> • Use one power supply. • To prevent the sneak path, connect a diode as shown below:  <p>DC input</p> <p>Input module</p> <p>Lamp</p> <p>Diode</p> <p>$E2$</p> <p>$E1$</p>

An input signal does not turn on (AC input module).

Cause	<p>Around the zero cross voltage of the input signal (AC), there are step-like deformations as shown below:</p> <p>Zero cross voltage</p> 
Action	Improve the input signal waveform by using an on-line type UPS and others.

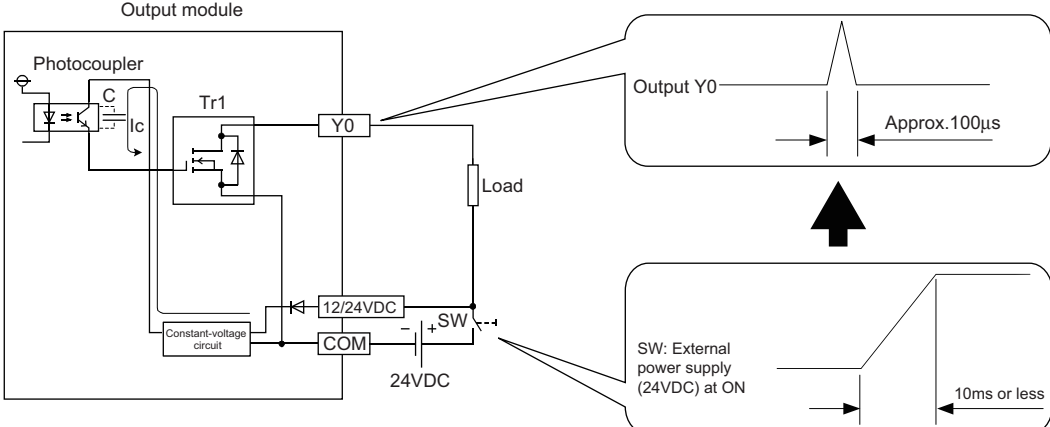
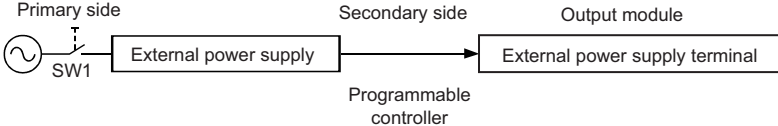
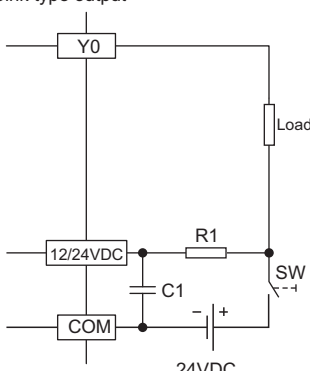
An unintended signal is inputted.

Cause	Noise is taken as input data.
Action	<p>Set the input response time longer.</p> <p>☞ Page 53 Input Response Time Setting (example) 1ms → 5ms</p> <p>If changing the setting of the input response time has no effect, take the following two measures:</p> <ul style="list-style-type: none"> • To prevent excessive noise, avoid installing power cables together with I/O cables. • Connect surge absorbers to noise-generating devices such as relays and conductors sharing the same power supply as noise reduction measures.

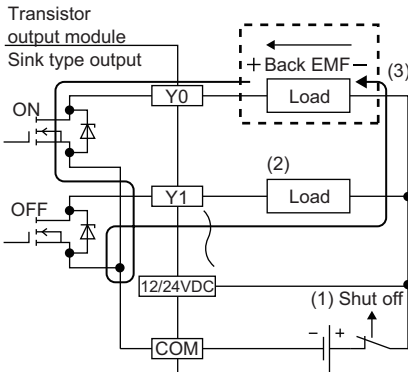
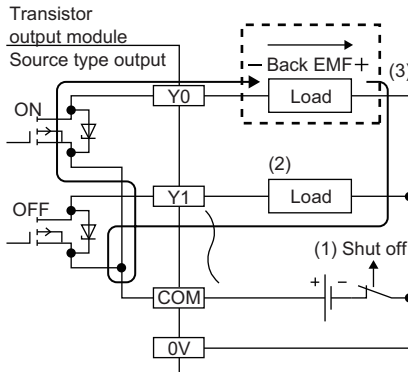
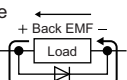
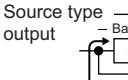
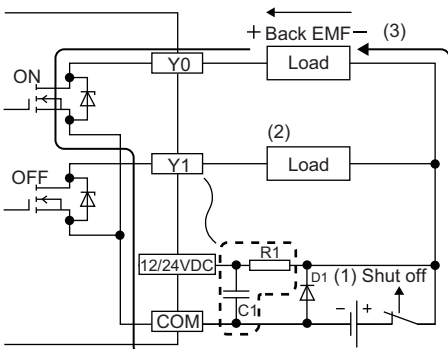
9.3 Output Circuit Troubles and Corrective Actions

9

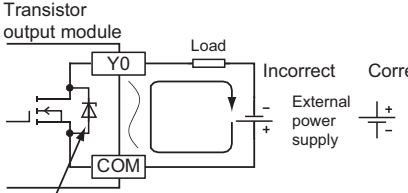
A load momentarily turns on when the external power supply is powered on.

Cause	<p>An incorrect output occurs due to the stray capacitance (C) between collector and emitter of a photocoupler. When a high sensitivity load (such as solid state relay) is used, this incorrect output may occur.</p>  <p>When the voltage rise time is less than 10ms at the power-on of the external power supply, the stray capacitance (C) between collector and emitter of the photocoupler allows the current, I_c, to flow into the gate of the transistor Tr1 on the next stage. As a result, the output Y0 is turned on for about 100µs.</p>
Action	<p>Action 1: Before turning on or off the external power supply, check that the rise time of the external power supply is 10ms or more. Then, install a switch (SW1) to the primary side of the external power supply.</p>  <p>Action 2: If necessary to install the switch to the secondary side, connect a capacitor and resistor to slow down the rise time (10ms or more). However, action 2 is not effective for the following source output modules because of the characteristics of the external power supply circuit, so that take action 1 above.</p> <ul style="list-style-type: none"> • RY40PT5P • RY41PT1P • RY42PT1P <p>Sink type output</p>  <p>R1: Several tens of ohms Power capacity $\geq (\text{external power supply current}^{*1})^2 \times \text{resistance value} \times (3 \text{ to } 5)^2$ C1: Several hundreds of microfarads 50V Example R1=40Ω, C1=300µF Time constant = $C1 \times R1 = 300 \times 10^{-6} \times 40$ $= 12 \times 10^{-3} [\text{s}]$ $= 12 [\text{ms}]$</p> <p>*1 Check the consumption current of the external power supply for modules used. *2 Select the power capacity of resistance to be 3 to 5 times larger than the actual power consumption.</p>

The load in the off state momentarily turns on at power off (transistor output).

Cause	<p>When an inductive load is connected, the load in the off state (2) may turn on due to a sneak current from the back EMF at the shutoff (1).</p> <div><div><p>Transistor output module Sink type output</p></div><div><p>Transistor output module Source type output</p></div></div>
Action	<p>Take either one of the following two actions:</p> <p>Action 1: To suppress the back EMF, connect a diode in parallel with the load under the back EMF influence (3).</p> <div><div><p>Sink type output</p></div><div><p>Source type output</p></div></div> <p>Action 2: Connect a diode into the path between the positive and negative terminals of the external power supply to provide a circulation path. When simultaneously performing the action described earlier under "A load momentarily turns on when the external power supply is powered on.", connect the diode in parallel with C1 and R2 (as shown in the dot frame of the figure below).</p> <p>Page 61 A load momentarily turns on when the external power supply is powered on.</p> <p>However, action 2 is not effective for the following source output modules because of the characteristics of the external power supply circuit, so that take action 1 above.</p> <ul style="list-style-type: none">• RY40PT5P• RY41PT1P• RY42PT1P <p>Sink type output</p>  <p>D1 is in the following status.</p> <ul style="list-style-type: none">· Reverse voltage VR (VRM) ... Approximately 10times higher than the rated voltage in the specifications Example 24VDC→Approximately 200V· Forward current IF (IFM) ... More than twice as much as the maximum load current (common) in the specifications Example 2A/1 common→4A or more

A load operates only by turning on the external power supply (transistor output).

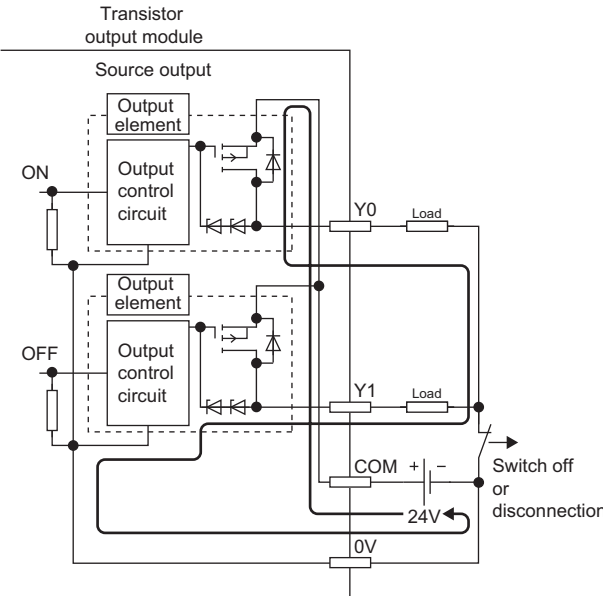
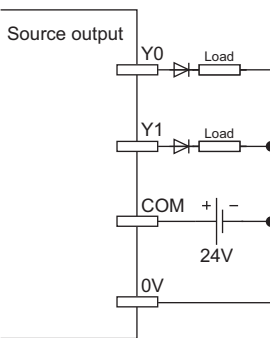
Cause	<ul style="list-style-type: none">• The external power supply is connected with its polarity reversed. <div><p>Transistor output module</p><p>Output element protection diode</p></div> <ul style="list-style-type: none">• The reversed polarity may allow current to flow via the output element protection diode into the load.
Action	<p>Connect the external power supply with the correct polarity.</p>

A load inputs data incorrectly due to a chattering.

Cause	A device with a high input response speed is connected to the contact output module.
Action	Use a transistor output module.

At output On, even loads in connection to other output simultaneously turn on.

The following fault example and its corrective action are for the transistor output (source type).

Cause	<p>A non-connection state between the external power supply 0V and the common line of the load due to interruption or disconnection causes a current to flow to the load in off state through the parasitic circuit connected to the output element in off state.</p>  <p>Continuous use in this condition may cause a failure.</p>
Action	<p>Correctly connect the external power supply and the load. To prevent further occurrence of the situation above, insert diodes to each output terminal as shown below:</p> 

APPENDICES

Appendix 1 Optional Items

Connector/terminal block converter modules

Model	Description	Weight	Applicable wire size	Applicable solderless terminal
A6TBXY36	For positive common type input module For sink/source type output module (standard type)	0.4kg	0.75 to 2mm ²	1.25-3.5 (JIS) 1.25-YS3A V1.25-M3
A6TBXY54	For positive common type input module For sink/source type output module (2-wire type)	0.5kg		V1.25-YS3A 2-3.5 (JIS) 2-YS3A
A6TBX70	For positive common type input module (3-wire type)	0.6kg		V2-S3 V2-YS3A

Included products

Product	Description	Quantity
M4×25 screw	A screw for mounting the connector/terminal block converter module onto a panel	2

Availability of the connector/terminal block converter module

Product	Model	A6TBXY36	A6TBXY54	A6TBX70
Input module* ¹	RX41C4	○	○	○
	RX42C4	○	○	○
Output module	RY41NT2P	○	○	×
	RY42NT2P	○	○	×
	RY41PT1P	○	○	×
	RY42PT1P	○	○	×
I/O combined module	RH42C4NT2P	Input side* ¹	○	○
		Output side	○	×

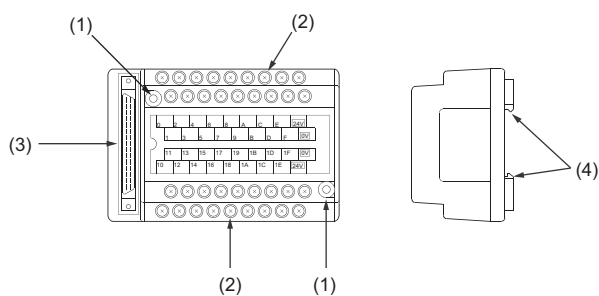
*¹ Available only when using a positive common.



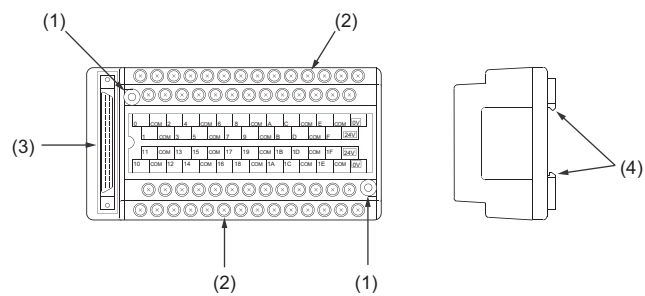
- The number of connectable I/O points is 32 for all the connector/terminal block converter modules. An I/O module with 64 points requires two sets of the connector/terminal block converter module and its cable.
- The terminal screws (M3.5) of the module require a tightening torque of 0.78N·m.

Part names

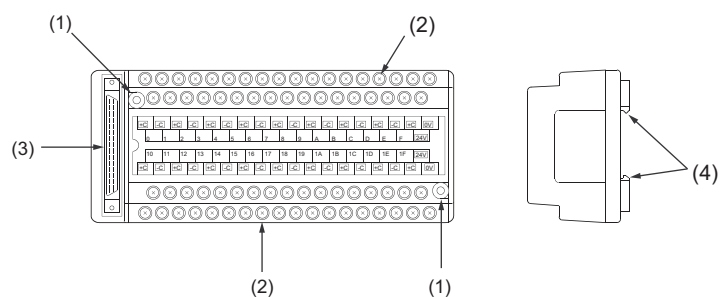
A6TBXY36




A6TBXY54



A6TBX70

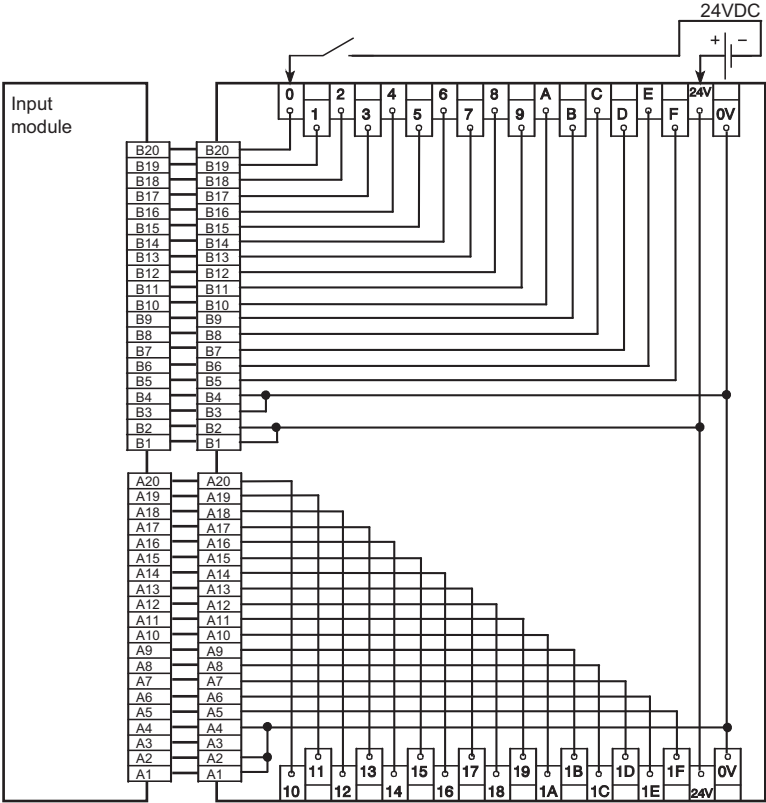


No.	Name	Description
(1)	Panel mounting hole	A hole for mounting the module onto a panel with the screw (M4 screw, included product)
(2)	Terminal block	A terminal block for connecting a power supply and I/O signal wire
(3)	40-pin connector	A connector for connecting the AC□□TB  Page 70 Connector-equipped dedicated cables
(4)	Module fixing hook	A hook for mounting the module onto a DIN rail

Connection diagram

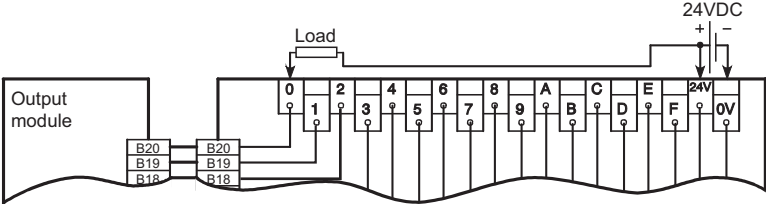
■A6TBXY36

When connecting an input module

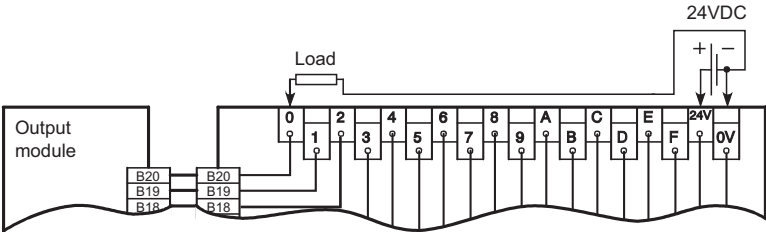


When connecting an output module

Sink type

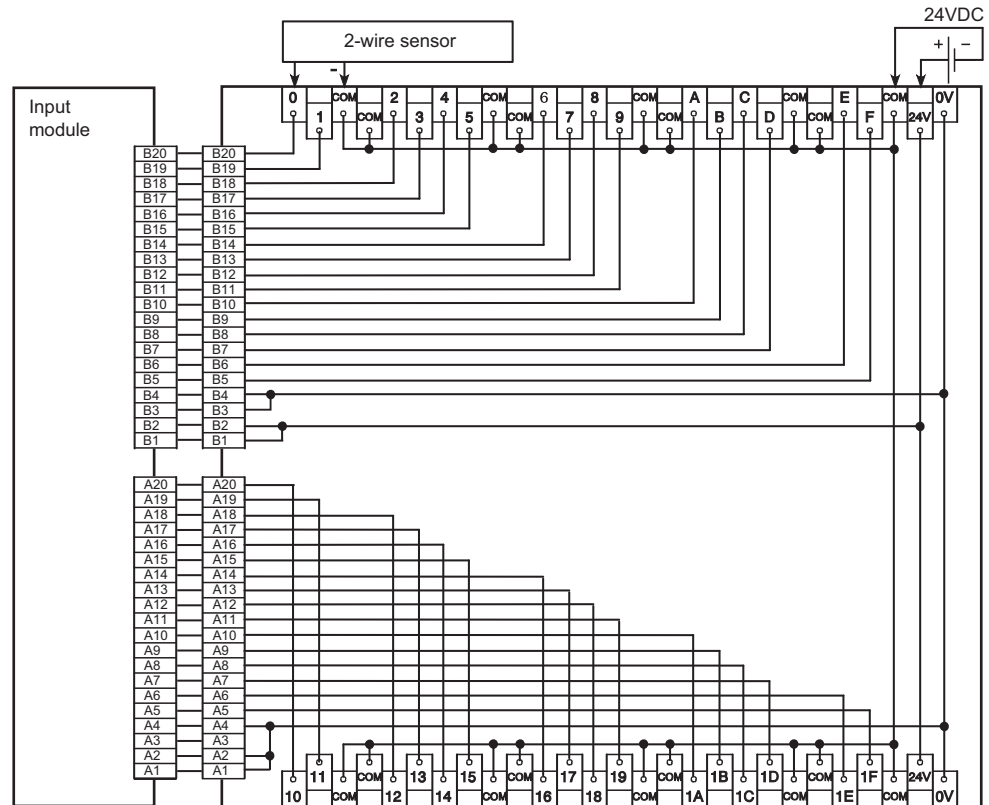


Source type



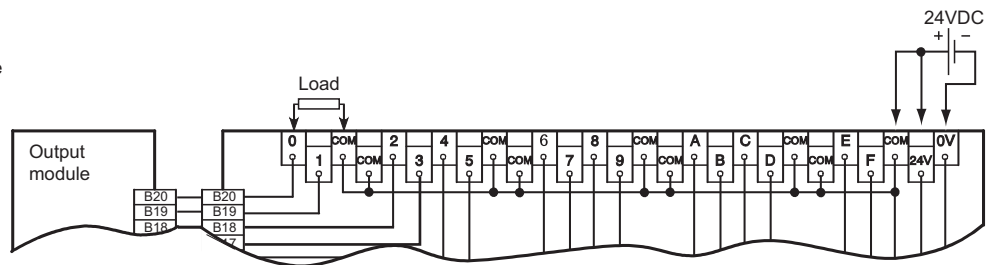
■A6TBXY54

When connecting an input module

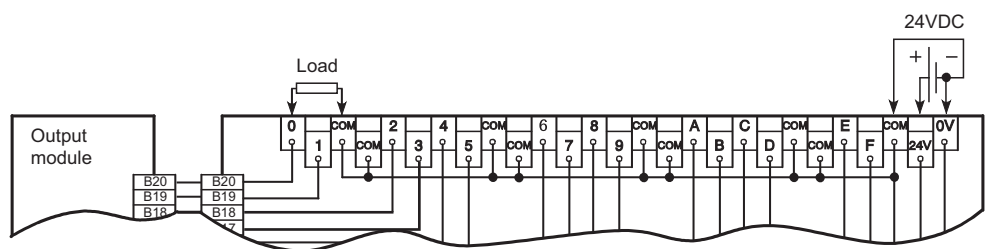


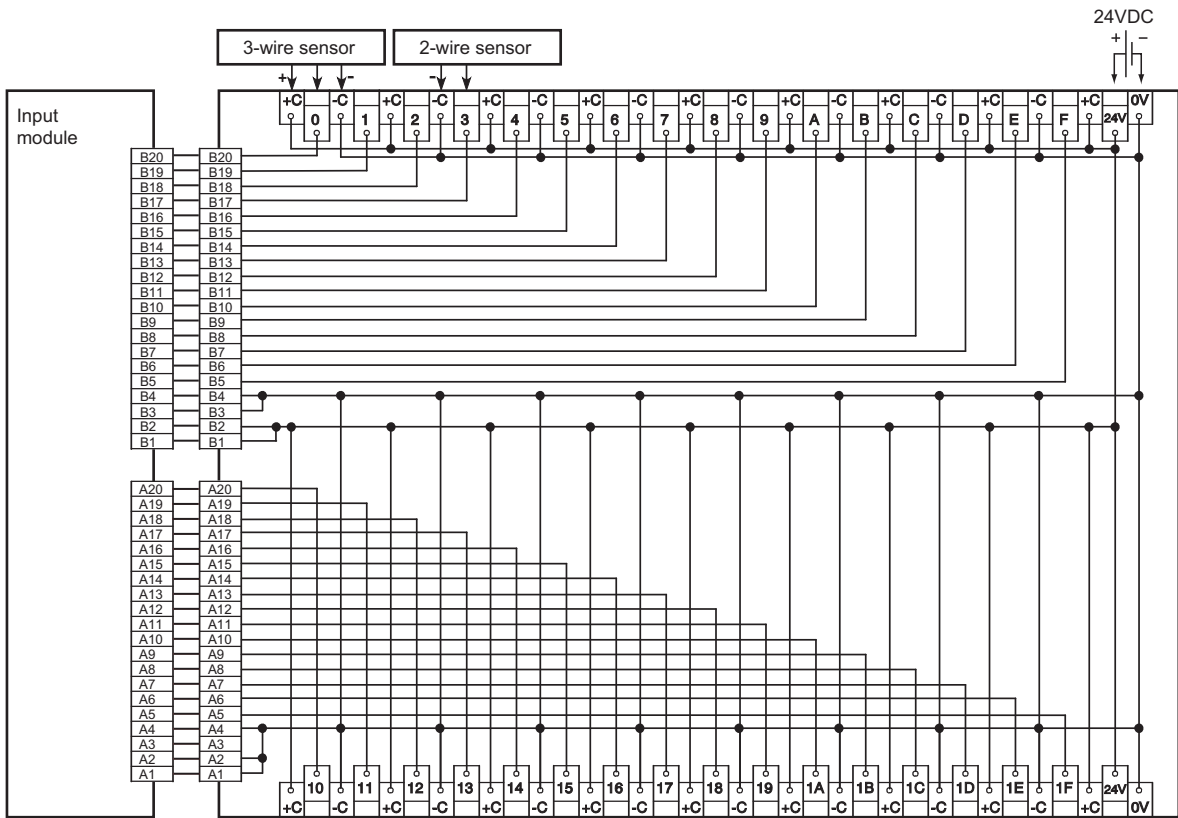
When connecting an output module

Sink type



Source type



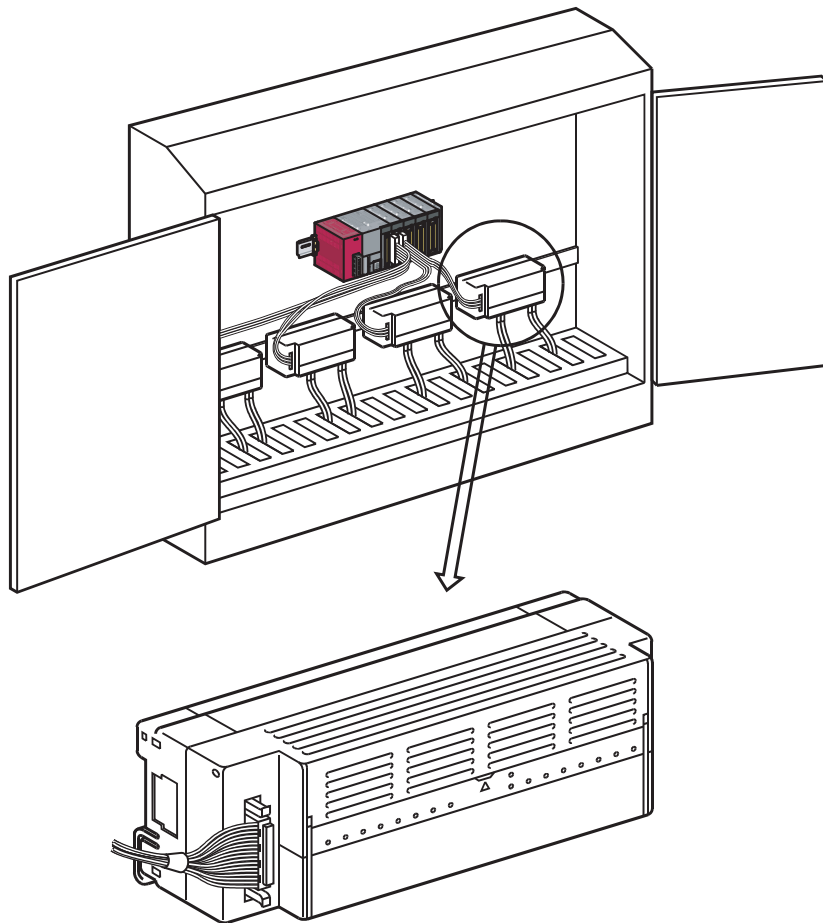


Relay terminal module (A6TE2-16SRN)

The A6TE2-16SRN serves as a substitute for the relay terminal blocks and relays in a control panel, which reduces the man-hours for wiring among the programmable controllers, relay terminal blocks, and relays. This module can be used only with the sink type output module (40-pin connector).

For details on the relay terminal module and dedicated cable with connector, refer to the following.

 Relay Terminal Module User's Manual (Hardware) A6TE2-16SRN



A6TE2-16SRN

Item		Specifications
Number of output points		16 points
Isolation method		Relay
Rated switching voltage/current		24VDC 2A (resistive load)/point, 8A/common 240VAC 2A (COS ϕ = 1)/point
Response time	OFF→ON	10ms or less
	ON→OFF	12ms or less
Surge suppressor		None
Fuse		None
Wiring method for common		8 points/common

Connector-equipped dedicated cables

For connector/terminal block converter module

Model	Description	Weight	Applicable module
AC05TB	0.5m, for sink/source type module	0.17kg	A6TBXY36 A6TBXY54 A6TBX70
AC10TB	1m, for sink/source type module	0.23kg	
AC20TB	2m, for sink/source type module	0.37kg	
AC30TB	3m, for sink/source type module	0.51kg	
AC50TB	5m, for sink/source type module	0.76kg	
AC80TB ^{*1}	8m, for sink/source type module	1.2kg	
AC100TB ^{*1}	10m, for sink/source type module	1.5kg	

^{*1} The cable length is so long that the voltage drop would be higher. When using the AC80TB and AC100TB, the common current should be 0.5A or lower.

For relay terminal module

Model	Description	Applicable module
AC06TE	0.6m, for sink type module	A6TE2-16SRN
AC10TE	1m, for sink type module	
AC30TE	3m, for sink type module	
AC50TE	5m, for sink type module	
AC100TE	10m, for sink type module	

Spring clamp terminal block

The spring clamp terminal block Q6TE-18SN for the Q series can be mounted for use.

For details on the Q6TE-18SN, refer to the following.

 Before Using the Product (BCN-P5999-0209)

Appendix 2 Compatibility of iQ-R Series I/O Modules with Q/L Series I/O Modules

This section describes the compatibility of iQ-R series I/O modules with Q/L series I/O modules.

18-point screw terminal block type module

Item	Compatibility with the Q series	Compatibility with the L series
Terminal block	Compatible and available. The terminal layout is the same as that of the Q series.	Not compatible and not available. The shape of the terminal block is different from the L series.

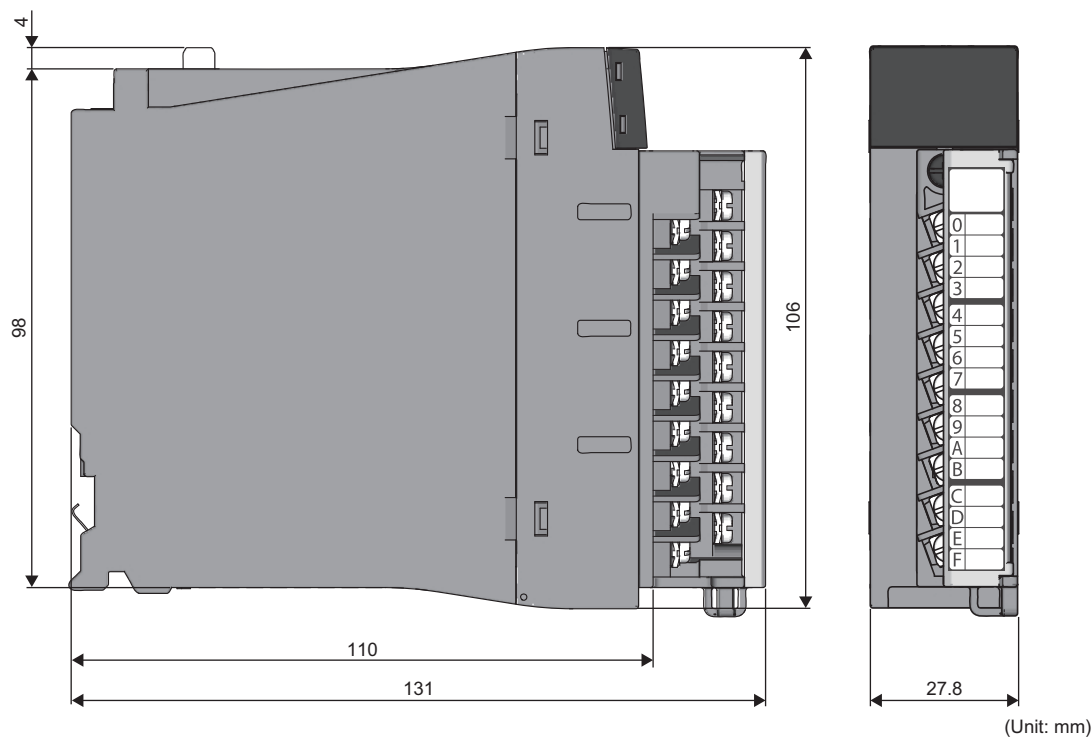
40-pin connector type module

Item	Compatibility with the Q series	Compatibility with the L series
Connector	Compatible and available. The pin layout is the same as that of the Q series.	Compatible and available. The pin layout is the same as that of the L series.

Appendix 3 External Dimensions

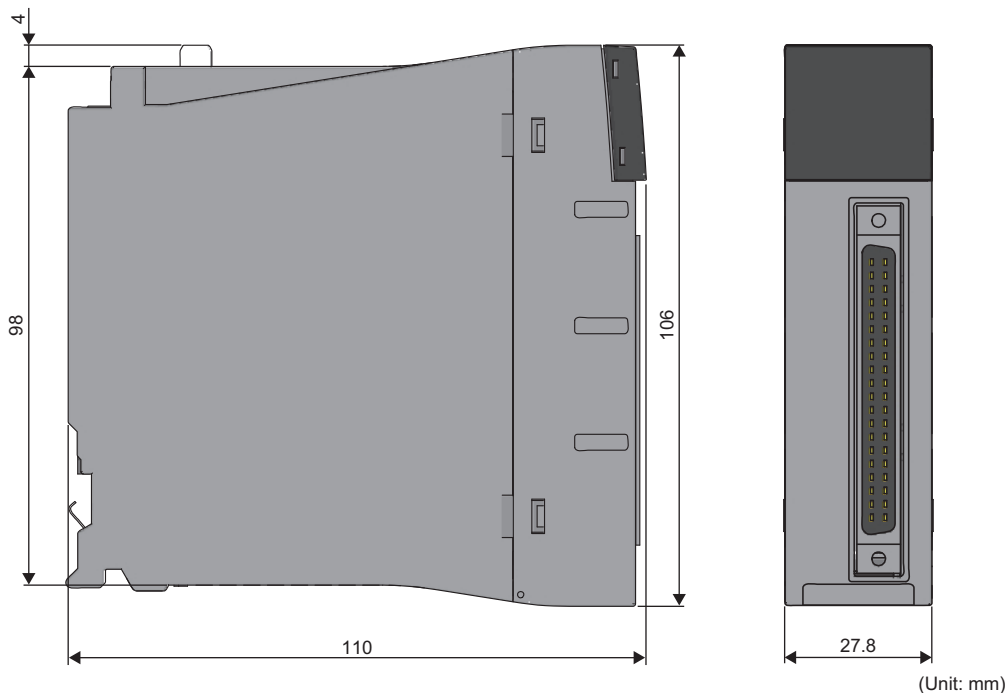
I/O module, blank cover module

18-point screw terminal block

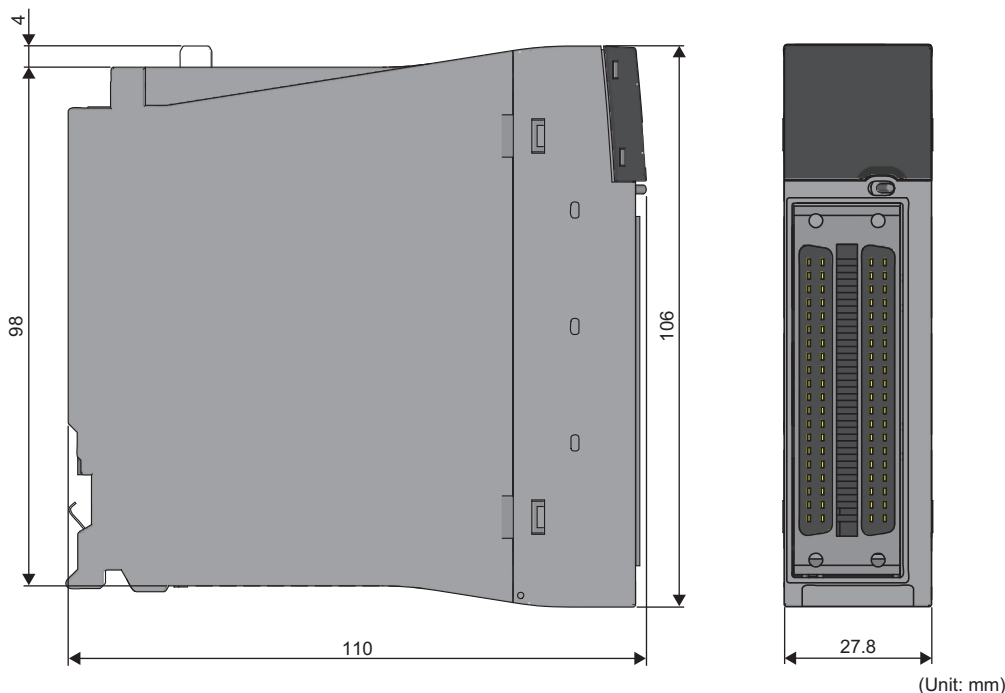


40-pin connector

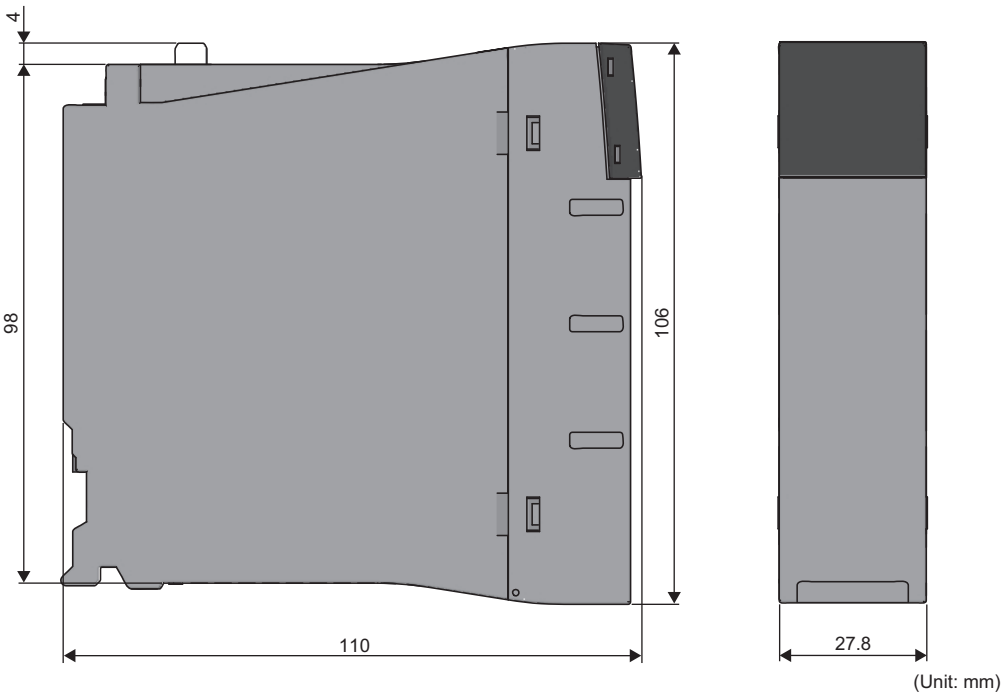
■32 points module



■64 points module



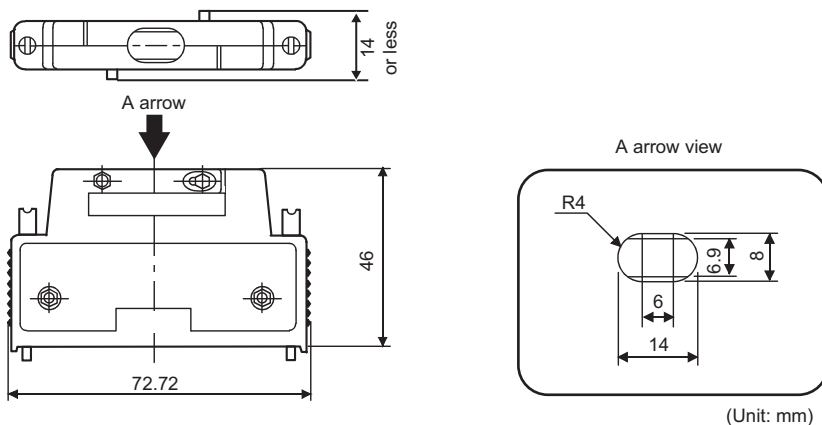
Blank cover module



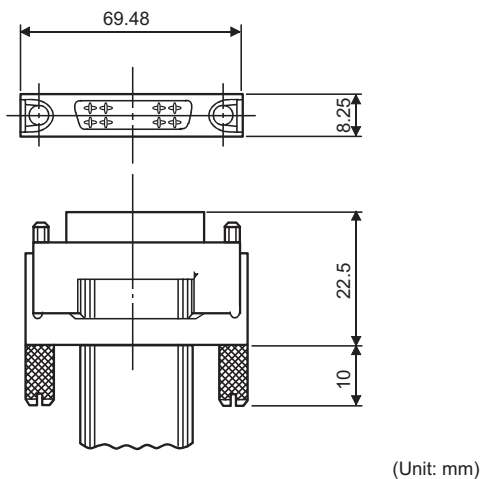
Connectors

A

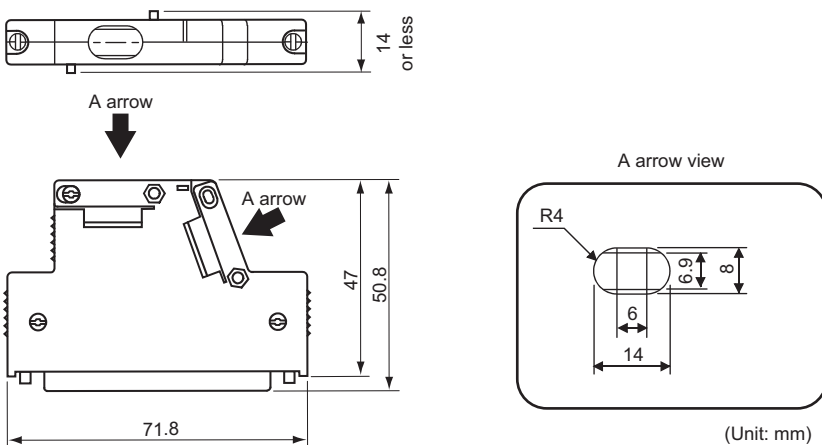
· A6CON1 (soldering type 40-pin connector), A6CON2 (crimp-contact type 40-pin connector)



· A6CON3 (pressure-displacement type 40-pin connector)



· A6CON4 (soldering type 40-pin connector)



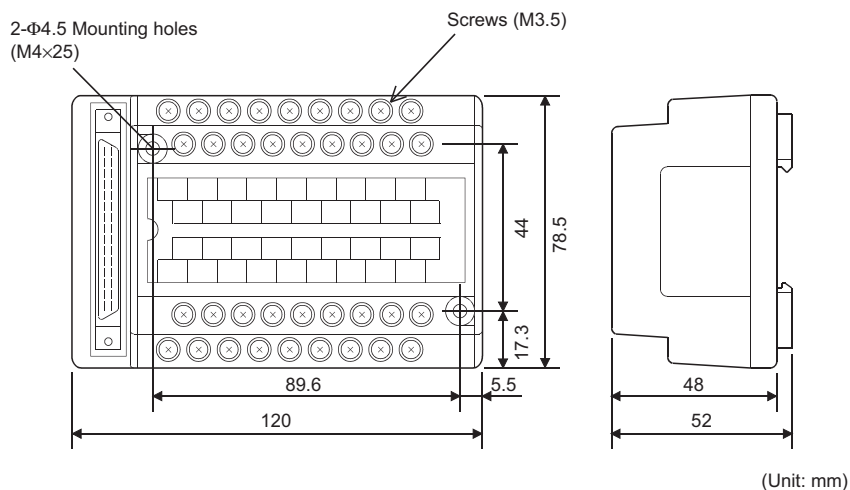
A smaller cable diameter than the clamp part may cause the cable to come off the clamp part.

Wrap the cable with tape and others to fix it before use.

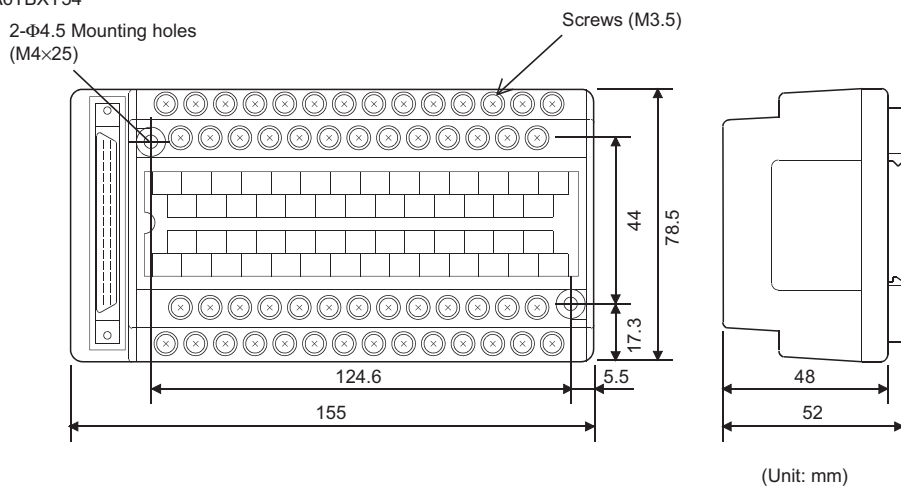
For the cable made of a slippery material, wrap it with rubber tape and others as an anti-slip measure.

Connector/terminal block converter modules

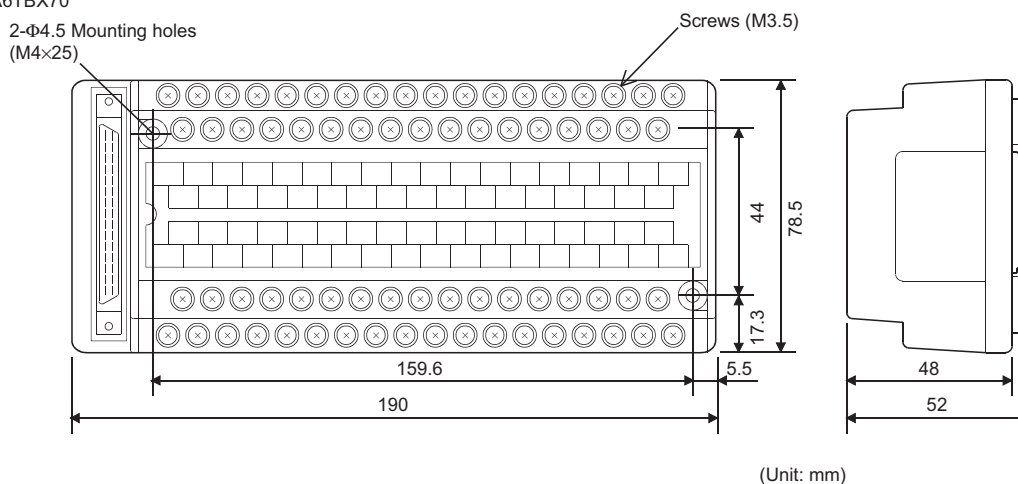
A6TBXY36



A6TBXY54

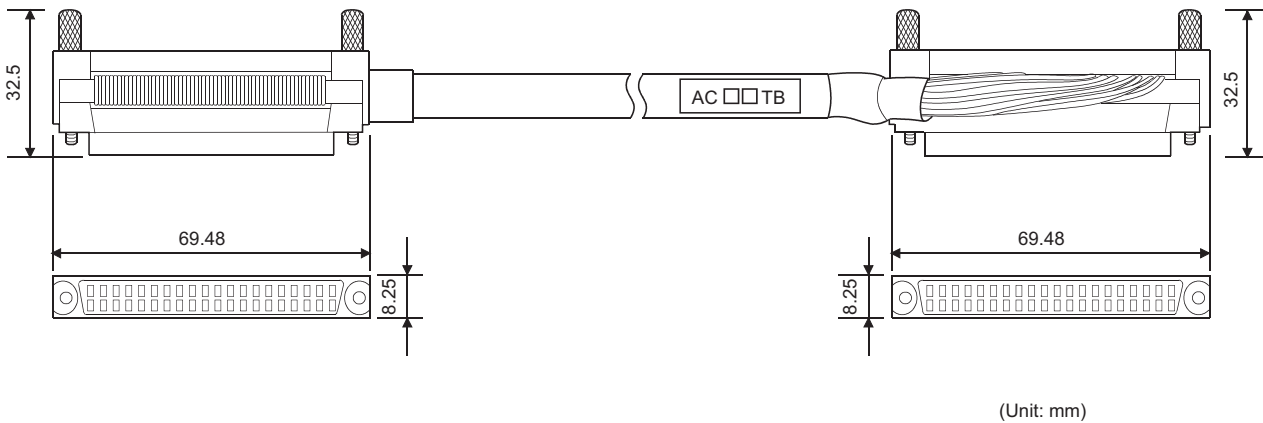


A6TBX70



Cable for connector/terminal block converter module

A



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REVISIONS

*The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
June 2014	SH(NA)-081247ENG-A	First edition

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1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place. Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

- (1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
- (2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
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 2. Failure caused by unapproved modifications, etc., to the product by the user.
 3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
 4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
 5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
 6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
 7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

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- (2) Product supply (including repair parts) is not available after production is discontinued.

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MODEL CODE: 13JX07

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